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KEY.

ADDITION.

(**67**, page 25.)

Ex. 3. *Ans.* 1982738.
Ex. 4. *Ans.* 435058.
Ex. 5. *Ans.* 3189.
Ex. 6. *Ans.* 289142.
Ex. 7. *Ans.* 415184.
Ex. 12. *Ans.* 3001623.
Ex. 13. *Ans.* 16977.
Ex. 16. *Ans.* 1881.
Ex. 17. *Ans.* 6076510.
Ex. 20. *Ans.* 21184000
Ex. 22. *Ans.* $1924950.

ADDING TWO OR MORE COLUMNS AT ONE OPERATION

(**68**, page 28.)

Ex. 5. Number of churches,	35887;
" " persons accommodated,	13847902;
Value of church property,	$85774659.

Ex. 6. Pounds of butter,	312625306;
" " cheese,	105735893;
" " wool,	52516961;
Bushels of wheat,	100485844.

SUBTRACTION.

(**75**, page 31.)

Ex. 5 *Ans.* 174333815.
Ex. 6. *Ans.* 2361650877.
Ex. 7 *Ans* 86602389426.
Ex. 8. *Ans.* 9000989311

Ex. 10. *Ans.* 86 years. Ex. 13. *Ans.* $44656513

Ex. 15. *Ans.* 2121108 square miles; 316636286 population

Ex. 20. *Ans.* 2657043.

TWO OR MORE SUBTRAHENDS.

(**76**, page 34.)

Ex. 5. 4568

1320

275

320

2653 *Ans.*

Ex. 6. 4756+575+140+84=5555

1200

750

96

3509 *Ans.*

Ex. 7. $15760

2175

3794

4587

$5204 *Ans.*

Ex. 8. $75860

45640

25175

$5045 *Ans.*

Ex. 9. 20000

11000

7000

Ans. 2000 square miles.

Ex. 10. 398470

157548

143429

97493 *Ans*

Ex 11 $61357088

52889800

234000

$8233288 *Ans.*

Ex. 12. $5760+$3575=$9335

2746

4632

$1957 *Ans*

Ex. 13. 643166
65038
114624
Ans. 463504

Ex. 14 $8186793
5700314
904299
$1582180 *Ans.*

Ex. 15. $12722470
7821556
424497
2355016
Ans. $2121401

MULTIPLICATION.

(**85**, page 38.)

Ex. 7 *Ans.* 43506216.
Ex. 8. *Ans.* 48288058.
Ex. 16 *Ans.* 24500.
Ex. 19. *Ans.* $31647000
Ex. 20. *Ans.* $909000.

POWERS OF NUMBERS

(**91**, page 39.)

Ex. 1. 72×72=5184.
Ex. 2. 12×12×12×12×12=248832.
Ex. 3. 25×25×25=15625.
Ex. 4. 7×7×7×7×7×7×7=823543
Ex. 5. 19×19×19×19=130321.
Ex. 6. 3×3×3×3×3×3=729

Ex. 7. *Ans.* $9^5=59049$; $11^3=1331$; $18^2=324$; $125^4=244140625$; $786^2=617796$; $94^6=689869781056$; $100^4=100000000$; $17^3=4913$; $251^5=996250626251$.

Ex. 8. $8^3=512$; $15^2=225$; and $512\times225=115200$, *Ans.*

Ex. 9. $25^2=625$; $3^4=81$; and $625\times81=50625$, *Ans.*

Ex. 10. $7^3\times200=68600$; $4^4\times11^2=30976$; and $68600-30976=37624$, *Ans.*

CONTRACTIONS IN MULTIPLICATION.

(**98**, page 42.)

Ex. 1. $736\times6\times4=17664$, *Ans.*

Ex. 2. $538\times8\times7=30128$, *Ans.*

Ex. 3. $27865\times7\times3\times4$, or $27865\times7\times12,=2340660$, *Ans.*

Ex. 4. $7856\times4\times4\times3\times3$, or $7856\times12\times12=1131264$, *Ans.*

Ex. 5. \$$185\times8\times7=$\$10360, *Ans.*

Ex. 6. $17740872\times8\times12=1703123712$ cubic feet, *Ans.*

(**99**.)

Ex. 3. *Ans.* 50000 dollars. **Ex.** 4. *Ans.* 100000000000

(**100**, page 43.)

Ex. 3. *Ans.* 10350000. **Ex.** 5. *Ans.* 192128000

(**102**, page 44.)

Ex. 1.
```
  5784
   246
 -----
 34704
138816
-------
1422864 Ans.
```

Ex. 2.
```
   3785
    721
  -----
26495
  79485
-------
2728985 Ans
```

Ex. 3. 472856
54918

4255704
8511408
25534224

25968305808 *Ans.*

Ex. 4. 43785
7153

131355
656775
306495

313194105 *Ans*

Ex. 5. 573042
24816

4584336
9168672
13753008

14220610272 *Ans.*

Ex. 6. 78563721
127369

707073489
2828293956
2121220467
78563721

10006582580049 *Ans*

Ex. 7. 43725652
5187914

393530868
787061736
306079564
612159128
218628260

226847922169928 *Ans.*

Ex. 8. 3578426785
64532164

14313707140
57254828560
114509657120
17892133925
229019314240

230923624151612740 *Ans*

Ex. 9. 2703605
4249784

18925235
132476645
113551410
227102820

11489737271320 *Ans.*

Ex. 10. 9462108
16824

75696864
227090592
151393728

159190504992 *Ans*

(44, 45)

EXAMPLES COMBINING THE PRECEDING RULES

(Page 45.)

Ex. 1. $28×175=$4900; $37×320=$11840; $4900+$11840=$16740, *Ans.*

Ex. 2. $1200—($364+$275+$150+$187)=$224; and $224×5=$1120, *Ans.*

Ex 3. 29+32=61; 61×17=1037 miles, *Ans.*

Ex 4. $34×127=$4318; $47×97=$4559; and $4318+$4559=$8877, cost; 127+97=224; $40×224=$8960, sold for; $8960—$8877=$83, profit, *Ans.*

Ex. 5. 77+56=133; 675—133=542, multiplicand. 3×156=468; 214—28=186; 468—186=282, multiplier. 542×282=152844, *Ans.*

Ex. 6. 37+50=87; 87×6=522; 98+522=620, multipliplicand. 64—50=14; 14×5=70; 70—10=60, multiplier. 620×60=37200, *Ans.*

Ex. 7. 14×25=350; 9×36=324; 350—324+4324=4350, multiplicand. 280—112=168; 376+42=418 418×4=1672; 168+1672=1840, multiplier. 4350×1840=8004000, *Ans.*

Ex. 8. $2751×29967= $82439217
$5030×23905=$120242150
$37802933 *Ans.*

Ex. 9. 1449075×203=294162225 acres cultivated; 1922890880—294162225=1628728655 acres, *Ans*

Ex. 10. $2258+$105=$2363, valuation per farm; $2363×1449075=$3424164225, *Ans.*

Ex. 11. $2^4 \times 5^5=50000$; $7^3=343$; 50000—343=49657, *Ans.*

Ex 12. $15^3=3375$; $3^2\times2^5=288$; $208^2=43264$; $9\times2^4=144$. $3375+43264=46639$; $288+144=432$; $46639-432=46207$, *Ans.*

Ex. 13. 4+27+256+3125+46656=50068, *Ans.*

Ex 14. 1200000×400=480000000 pounds, *Ans.*

Ex. 15. - - - $2450, value of house;
$2450×6—$500=14200, " " farm;
$2450×2= 4900, " " stock;

Ans. $21550, total value.

Ex. 16. 1500×$7=$10500; 800×$10=$8000; 700×$6=$4200; $8000+$4200=$12200; $12200—$10500=$1700, *Ans.*

Ex. 17. ($450+$780+$1250+$2275)×3=$14265, *Ans.*

Ex. 18. $115×35000=$4025000, *Ans.*

Ex 19. $485×2500 =$1212500
$1450×10 = 14500
$1250×25 = 31250

$1258250 *Ans.*

Ex. 20. 1401944×$20=$28038880, value of double eagles;
62990×$10= 629900, " " eagles;
154555× $5= 772775, " " half eagles;
22059× $3= 66177, " " $3 pieces.

Ans. $29507732, total value.

DIVISION.

(**111**, page 49.)

Ex. 1. *Ans.* 78972. Ex. 2. *Ans.* 121562.
Ex. 3. *Ans.* 152329. Ex. 4. *Ans.* 6086847.

Ex: 9. *Ans.* 7198.	Ex. 10. *Ans.* 7071.
Ex. 11. *Ans.* 15607.	Ex. 12. *Ans.* $48340\frac{7}{232}$
Ex. 13. *Ans.* $125397\frac{124}{216}$.	Ex. 14. *Ans.* $5479\frac{5219}{5317}$.
Ex. 15. *Ans.* $2084768\frac{1255}{2359}$.	Ex. 16. *Ans.* $2478\frac{100}{291}$.
Ex. 17. *Ans.* $5851\frac{342}{657}$.	Ex. 18. *Ans.* $591862\frac{401}{967}$
Ex 19. *Ans.* $15395919\frac{12214}{37149}$.	Ex. 20. *Ans.* $901\frac{5009}{54001}$.

Ex. 21. $\$147675 \div 365 = \$404\frac{215}{365}$ *Ans.*

Ex. 22. $\$30732518 \div 556 = \$55274\frac{174}{556}$ *Ans.*

Ex. 23. $\$5572470 \div 287 = \$19416\frac{78}{287}$ *Ans.*

Ex. 24. $\$8186793 \div 27977 = \$292\frac{17509}{27977}$ *Ans.*

ABBREVIATED LONG DIVISION.

(112 page 51.)

```
Ex. 1.  204)77112(378 Ans.
             159
              163

Ex. 2.  72)65664(912 Ans.
              8
              14

Ex. 3.  209)7913576(37864 Ans.
             164
              180
               133
                83

Ex. 4.  698)6636584(9508 Ans.
             354
               55

Ex. 5.  8903)4024156(452 Ans.
              4629
               1780
```

Ex. 6. 6791)760592(112 *Ans.*
814
1358

Ex. 7. 25203)101443929($4025\frac{1854}{25203}$ *Ans.*
631
12786
1854

Ex. 8. 269181)1246038849(4629 *Ans.*
169314
78062
242262

Ex. 9. 56240)2318922($41\frac{13082}{56240}$ *Ans.*
6932
13082

Ex. 10. 17300)1454900($84\frac{1700}{17300}$ *Ans.*
7090
1700

CONTRACTIONS IN DIVISION.

(**121** page 57.)

Ex 1. 3(435
5)145
29 *Ans.*

Ex. 2. 7)4256
8)608
76 *Ans*

Ex. 3. 9)17856
8)1984
248 *Ans.*

Ex. 4. 2)15288
3)7644
7)2548
364 *Ans*

Ex. 5 8)972552
7)121569
3)17367
5789 *Ans.*

Ex. 6. 9)526050
7)58450
2)8350
4175 *Ans*

Ex. 7. 7)612360
5)87480
3)17496
5832 *Ans.*

Ex. 8. 3)553
5)184 - - - - - - 1
Quotient, 36 - - 4×3=12
13, remainder.

Ex. 9. 3)10183
5)3394 - - - - - - - - 1
7)678 - - - 4×3=12
Quotient, 96 - 6×5×3=90
103, remainder.

Ex. 10. 2)10197
3)5098 - - - - - - - - - 1
4)1699 - - - - - 1×2= 2
5)424 - - - 3×3×2=18
Quotient, 84 - 4×4×3×2=96
117, remainder

Ex. 11. 3)29792

8)9930 - - - - - - - - - - 2

6)1241 - - - - - 2×3= 6

Quotient, 206 - - -5×8×3 =120

128, **remainder**

Ex. 12 4)73522

6)18380 - - - - - - - - 2

7)3063 - - - - - 2×4= 8

Quotient, 437 - - - 4×6×4= 96

106, **remainder**

Ex. 13. 3)63844

5)21281 - - - - - - - - 1

9)4256 - - - - 1×3= 3

Quotient, 472 - - - 8×5×3=120

124, **remainder**

Ex 14. 2)386639

3)193319 - - - - - - - - - 1

4)64439 - - - - - - 2×2= 4

5)16109 - - - - 3×3×2= 18

6)3221 - - 4×4×3×2= 96

Quotient, 536 5×5×4×3×2=600

719, **remainder**

Ex. 15. 4)734514

6)183628 2

7)30604 . . . . . 4×4= 16

Quotient, 4372 **18, remainder.**

Ex. 16. 9)636388

9)70709 7

9)7856 . . . . 5×9= 45

Quotient, 872 . . . . . 8×9×9=648

700, remainder

Ex. 17. 5)4619

5)923 . . . . **4**

5)184 . . . . **3**×**5**= **15**

Quotient, 36 . . . . **4**×5×**5**=**100**

119, remainder

Ex. 18. 3)116423

7)38807 . . . . **2**

7)5543 . . . . **6**×**3**= **18**

8)791 . . . . **6**×7×**3**= **126**

9)98 . . . . . 7×7×7×**3**=**1029**

Quotient, 10 . . . 8×8×7×7×3=**9408**

10583, remainder

Ex. 19. 5)79500

5)15900

5)3180

7)636

7)90 . . . . . 6×5×5×5= 750

Quotient, 12 . . . . 6×7×5×5×5=5250

6000, remainder

(**122**, page 58.)

Ex 2. *Ans.* $79\frac{82}{100}$. Ex. 4. *Ans.* $230\frac{1060}{10000}$.

(**123**.)

Ex. 2. *Ans.* $27\frac{172}{500}$. Ex. 6. *Ans.* $8206\frac{2408}{8100}$

Ex. 7. *Ans.* 3005.

EXAMPLES COMBINING THE PRECEDING RULES.

(Page 59.)

Ex. 1. \$4×25=\$100; \$3×36=\$108; \$100+\$108=\$208; 208÷8=26, *Ans.*

Ex. 2 \$16×12=\$192; \$13×17=\$221; \$192+\$221=\$413, cost; \$18×(12+17)=\$522; \$522—\$413=\$109, *Ans.*

Ex. 3 \$2×300+\$750=\$1350, value of produce;
\$3×120+ \$90= \$450, " " stock;
\$900÷25=\$36, *Ans.*

Ex. 4. $450+(\overline{24-12)\times5}=510$;
$(90\div6)+(\overline{3\times11)-18}=30$;
$510\div30=17$, *Ans.*

Ex. 5. $648\times\overline{(3^2\times2^3)\div9}=5184$; $2910\div15=194$; $5184-194=4990$, dividend; $4375\div175=25$; $25\times4^2+3^2=409$; $2863\div409=7$, divisor. Hence, $4990\div7=712\frac{6}{7}$, *Ans.*

Ex. 6. $42\times34=1428$; $107100\div1428=75$, *Ans.*

Ex. 7. Reversing the fifth operation, $12\times24=288$;
reversing the fourth operation, $288\div6=48$;
reversing the third operation, $48+(28-16)=60$;
reversing the second operation, $60-(7^2+1)=10$;
reversing the first operation, $10\times45=450$, *Ans.*

Ex. 8. \$60—\$42=\$18; \$36×50=\$1800;
$1800\div18=100$ months, *Ans.*

Ex. 9. $251104\div472=532$, *Ans.*

Ex. 10. $3042^2=9253764$, *Ans.*

Ex. 11. $453\times307+109=139180$, *Ans.*

Ex. 12. \$4+\$7=\$11; \$1276÷\$11=116, number of each kind; $116\times2=232$, whole number purchased; \$7—\$4=\$3; \$3×116=\$348, difference in cost.

Ex. 13. \$950+\$7500=\$8450;
\$13982686÷\$8450=1654, and a remainder of \$6386.

Ex. 14. $\overline{\$54\times4300000}\div\$60=3870000$ tons, *Ans.*

Ex. 15. $23191876\div400=57979\frac{276}{400}$. Hence, by this estimate, 57979 persons died.

Ex. 16. $508464\div10593=48$, *Ans.*

(59, 60)

Ex 17. $\$7680 \div \$64 = 120$, number sold;
$\$960 \div 120 = \$8$, gained per head;
$\$64 - \$8 = \$56$, cost per head;
$\$9800 \div \$56 = 175$, number bought.

Ex. 18. $\$95 \times 6 + \$1200 = \$1770$; $\$1770 \div 30 = \$59$, *Ans.*

Ex. 19. $36 \times 16 = 576$, number of days' work required;
$576 \div 24 = 24$, number of days 24 men will require

Ex 20. $\$1650 \div 275 = \$6$, cost per barrel;
$(\$9 - \$6) \times 186 = \$558$, gain.

Ex. 21. $840 \div (5+10+15) = 28$, of each kind; hence, $28 \times 3 = 84$, whole number.

Ex. 22. $\$965 - (\$5 \times 160) = \$165$; $165 \div 3 = 55$ tons, unsold; $160 + 55 = 215$ tons bought.

Ex. 23. $\$3825 \div \$85 = 45$, number sold;
$\$7560 \div (\$85 + \$5) = 84$, whole number of horses,
$(\$7560 + \$945) - \$3825 = \$4680$, to be realized on the remainder.
Hence, $\$4680 \div (84 - 45) = \$120$, *Ans.*

Ex. 24. $\$22360 + \$1742 = \$24102$, total cost;
$\$15480 \div \$18 = 860$; $860 \times 2 = 1720$, No. acres;
$\$22360 \div 1720 = \$13$, original cost per acre.

PROBLEMS IN SIMPLE INTEGRAL NUMBERS.

(**127**, page 62.)

The following are the *general solutions:*

Prob. 1. Add the several numbers.

Prob 2. Subtract the sum of the given numbers from the sum of all.

Prob 3. Add the parts.

Prob 4. Subtract the sum of the given parts from the whole

Prob. 5. Subtract the less from the greater.

Prob. 6. Subtract the difference from the greater.

Prob. 7. Add the difference to the less.

Prob. 8 Subtract the subtrahend from the minuend.

Prob. 9. Subtract the remainder from the minuend

Prob 10 Add the subtrahend and remainder.

Prob. 11 Multiply the numbers together.

Prob. 12. Divide the product by the given factor.

Prob. 13. Divide the continued product by the product of the given factors.

Prob. 14. Multiply the factors together in continued multiplication.

Prob. 15. Multiply the multiplicand by the multiplier.

Prob. 16. Divide the product by the multiplicand.

Prob. 17. Divide the product by the multiplier.

Prob. 18. Divide each number by the other.

Prob. 19. Divide the dividend by the divisor.

Prob. 20. Multiply the divisor and quotient together.

Prob. 21. Divide the dividend by the quotient.

Prob. 22. Multiply the divisor by the quotient, and to the product add the remainder.

Prob. 23. Subtract the remainder from the dividend, and divide the result by the quotient.

Prob. 24. Multiply the final quotient and the several divisors together.

Prob. 25. Divide the first dividend by the continued product of the final quotient into all the given divisors.

Prob. 26. Divide the dividend by the several divisors successively.

Prob. 27. Add together the numbers comprising each set, and subtract the less sum from the greater.

(63. 64)

Prob 28. Multiply together the factors comprising each set, and add the several products.

Prob. 29. Multiply together the factors comprising each set, and then add the products and given numbers.

Prob. 30. Multiply together the factors comprising each set, and subtract the less product from the greater.

Prob 31 Add the product of the given set or sets of factors and the given number or numbers.

Prob. 32 Subtract the sum of the products of the set or sets of factors which form the less number from the sum of the products of the set or sets of factors which form the greater number.

PROPERTIES OF NUMBERS.

FACTORING.

(**142**, page 71.)

Ex. 1. *Ans.* 2, 5, 5, 43. Ex. 2. *Ans.* 3, 5, 163.
Ex. 3. *Ans.* 2, 2, 3, 3, 5, 5, 7.
Ex. 4. *Ans.* 2, 2, 2, 2, 2, 2, 2, 2 ,2, 2, 3, 7.
Ex. 5. *Ans.* 2, 7, 13, 13. Ex. 6. 2, 2, 2, 5, 5, 5
Ex. 7. *Ans.* 5, 5, 5, 5, 5, 5, 5, 5.
Ex. 8. *Ans.* 3, 3, 3, 7, 11, 13, 37.

(**144**, page 74.)

Ex. 2. *Ans.* 2, 3, 7, 17, 17, 29. Ex. 3. *Ans.* 13, 17, 31
Ex. 4. *Ans.* 17, 19, 29. Ex. 5. *Ans.* 2, 11, 19, 487.
Ex. 6. *Ans.* 7, 83, 103. Ex. 7. *Ans.* 97, 103
Ex. 8. *Ans.* 3, 5, 59, 139.
Ex. 9. *Ans.* 3, 5, 7, 47, 181.

Ex. 10. *Ans.* 2, 2, 2, 2, 2, 2, 41, **149.**

Ex. 11. *Ans.* 7, 11, 37, 79.

Ex. 12. *Ans.* 2, 5, 13, 17, 37.

Ex. 13. *Ans.* 13, 17, 29.

Ex. 14. *Ans.* 2, 2, 2, 3, 17, 19, 23.

Ex. 15. *Ans.* 2, 3, 5, 7, 19, 179.

(**145,** page 76.)

Ex. 1. $120=1\times2\times2\times2\times3\times5$

1,	2,	4,	8	Combinations of 1 and 2.
3,	6,	12,	24	“ “ 1, 2, and 3.
5,	10,	20,	40	“ “ 1, 2, 3, and 5
15,	30,	60,	120	

Ans. 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 24, 30, 40, 60, 120

Ex. 2. $84=1\times2\times2\times3\times7$

1,	2,	4	Combinations of 1 and 2.
3,	6,	12	“ “ 1, 2, and 3.
7,	14,	28	“ “ 1, 2, 3, and 7.
21,	42,	84	

Ans. 1, 2, 3, 4, 6, 7, 12, 14, 21, 28, 42, 84.

Ex. 3. $100=1\times2\times2\times5\times5$

1,	2,	4	Combinations of 1 and 2.
5,	10,	20	“ “ 1, 2, and 5
25,	50,	100	

Ans. 1, 2, 4, 5, 10, 20, 25, 50, 100.

Ex. 4. $420=1\times2\times2\times3\times5\times7$

1,	2,	4	Combinations of 1 and 2.
3,	6,	12	“ “ 1, 2, and 3.
5,	10,	20	“ “ 1, 2, 3, and 5.
15,	30,	60	
7,	14,	28	“ “ 1, 2, 3, 5, and 7
21,	42,	84	
35,	70,	140	
105,	210,	420	

Ans. 1, 2, 3, 4, 5, 6, 7, 10, 12, 14, 15, 20, 21, 28, 30, 35, 42, 60, 70, 84, 105, 140, 210, 420

Ex. 5. $1050=1\times2\times5\times5\times3\times7$

1,	5,	25	Combinations of	1 and 5.
2,	10,	50	" "	1, 5, and 2.
3,	15,	75	" "	1, 5, 2, and 3
6,	30,	150		
7,	35,	175	" "	1, 5, 2, 3, and 5
14,	70,	350		
21,	105,	525		
42,	210,	1050		

Ans. 1, 2, 3, 5, 6, 7, 10, 14, 15, 21, 25, 30, 35, 42,
50, 70, 75, 105, 150, 175, 210, 350, 525, 1050.

GREATEST COMMON DIVISOR.

(**149**, page 77.)

Ex. 2. $2\times3=6$, *Ans.* **Ex.** 5. $6\times7=42$, *Ans*

Ex. 8. $3\times3\times7=63$, *Ans.* **Ex.** 9. 91, *Ans.*

Ex. 11. $4\times3\times7=84$, *Ans.*

(**150**, page 81.)

Ex. 4. *Ans.* 11. **Ex.** 5. *Ans.* 1.

Ex. 7. *Ans.* 17. **Ex.** 8. *Ans.* 337

Ex. 10. In the operation under this rule, the quotient figure may always be so taken that the product shall be either greater, or less, than the dividend; in either case, the new divisor will be the *difference* between the dividend and product. It will always be found advantageous to use that quotient figure which will give the least number for a new divisor. In the first operation below, the second quotient figure is 1, and the next divisor is 413690; in the second operation, the second quotient figure is 2, which gives 178593 for the next divisor, and abbreviates the subsequent work

FIRST OPERATION.

		4616175
1005973	4	4023892
592283	1	592283
413690	1	413690
357186	2	178592
56504	3	169512
54486	6	9081
2018	4	8072
2018	2	1009, *Ans.*

SECOND OPERATION.

		4616175
1005973	4	4023892
1184566	2	592283
178593	3	535779
169512	3	56504
9081	6	54486
8072	4	2018
Ans. 1009	2	2018

Ex. 13. *Ans.* 47.

Ex. 15. In order that the bins may be equal, the number of bushels contained in one bin must be a *common divisor* of the two quantities. And in order that the number of bins may be the least possible, each must contain the *greatest* common divisor of the two quantities. *Ans.* 91 bushels.

Ex. 16. The pannels, to be of uniform length, must be a common measure or divisor of the three sides; and to be of the greatest possible length, they must be the greatest common divisor of the three sides. *Ans.* 11 feet.

Ex. 17. The price to be paid by each is the greatest common divisor of the three sums, \$620, \$1116, and \$1488, which is \$124. Hence, B can purchase \$620÷\$124=5; C can purchase \$1116÷\$124=9; and D can purchase \$1488÷\$124=12.

Ex. 18. The greatest common divisor of 14599 feet and 10361 feet is 13 feet, the length of 1 joint in the fence (14599+10361)×2=49920 feet, the entire length of the fence. 49920÷13=3840, the number of joints in the fence; and 3840×7=26880, the number of rails, *Ans.*

LEAST COMMON MULTIPLE.

(**155**, page 83.)

Ex. 1. 2×2×3×11×7×5=4620, *Ans.*
Ex. 2. 7×3×3×2×2×11×5=13860, *Ans.*
Ex. 3. 5×3×2×2×2=120, *Ans.*
Ex. 4. 7×5×3×2×2×2×2=1680, *Ans.*
Ex. 5. 7×5×5×3=525, *Ans.*
Ex. 6. 19×3×7×2=798, *Ans.*
Ex. 7. 2×2×2×2×2×2×3×3×5=2880, *Ans.*

(**156**, page 85.)

Ex. 1.

$$\begin{array}{r|l} 5, 3, 2 & 15..18..21..24..35..36..42..50..60 \\ \hline 2, 2, 3, 7, 5 & \;\;3..\;7..\;4..\;7..\;6..\;7..\;5..\;2 \end{array}$$

5×3×2×2×2×3×7×5=12600, *Ans.*

Ex. 2.

$$\begin{array}{r|l} 2, 2, 3 & 6..8..10..15..18..20..24 \\ \hline 2, 3, 5 & \;\;2..\;5..\;5..\;3..\;5..\;2 \end{array}$$

2×2×3×2×3×5=360, *Ans.*

Ex. 3

$$\begin{array}{r|l} 3, 5, 2 & 9..15..25..35..45..100 \\ \hline 3, 5, 7, 2 & 3..\quad\;\;5..\;7..\;3..\;10 \end{array}$$

3×5×2×3×5×7×2=6300, *Ans.*

Ex. 4.

$$\begin{array}{r|l} 3, 3, 2 & 18..27..36..40 \\ \hline 2, 2, 5, 3 & \;\;3..\;2..20 \end{array}$$

3×3×2×2×2×5×3=1080, *Ans.*

Ex. 5.

$$\begin{array}{r|l} 2,\ 3 & 12..26..52 \\ \cline{2-2} 2,\ 13 & 2..13..26 \\ \hline \end{array}$$

$2\times2\times3\times13=156$, *Ans.*

Ex. 6.

$$\begin{array}{r|l} 2,\ 2,\ 17 & 32..34..36 \\ \cline{2-2} 8,\ 9 & 8..\quad 9 \\ \hline \end{array}$$

$2\times2\times17\times8\times9=4896$, *Ans.*

NOTE.—When numbers are prime to each other, as 8 and 9 in the above operation, their product will be their least common multiple.

Ex. 7.

$$\begin{array}{r|l} 2,\ 2,\ 3 & 8..12..18..24..27..36 \\ \cline{2-2} 2,\ 3,\ 3 & 2..\quad 3..\ 2..\ 9..\ 3 \\ \hline \end{array}$$

$2\times2\times2\times3\times3\times3=216$, *Ans.*

Ex. 8.

$$\begin{array}{r|l} 2,\ 11 & 22..33..44..55..66 \\ \cline{2-2} 2,\ 3,\ 5 & \quad 3..\ 2..\ 5..\ 3 \\ \hline \end{array}$$

$2\times11\times2\times3\times5=660$, *Ans.*

NOTE.—The first three numbers in Ex. 7 and the first two in Ex. 8, above, are factors of remaining numbers in the examples respectively. They might, therefore, have been omitted in the operations.

Ex. 9.

$$\begin{array}{r|l} 2,\ 2,\ 3 & 64..84..96..216 \\ \cline{2-2} 2,\ 2,\ 2,\ 2 & 16..\ 7..\ 8..\ 18 \\ \cline{2-2} 3,\ 3,\ 7 & \quad 7 \quad\quad 9 \\ \hline \end{array}$$

$2\times2\times2\times2\times2\times2\times3\times3\times3\times7=12096$, *Ans*

Ex. 10. The number of rods that will furnish *whole* days' work to each one, must be some common multiple of 14, 25, 8 and 20; and the *least* number of rods that will furnish whole days' work to each of the men, must therefore be the *least* common multiple of 14, 25, 8 and 20.

Ans. 1400 rods.

Ex. 11. The least common multiple of the prices, \$4, \$21, \$49, and \$72, which is \$3528, *Ans.*

Ex. 12. When all the men work together, they will dig 4+8+6=18 rods per day. The ditch must therefore be the least common multiple of 4 rods, 8 rods, 6 rods, and 18 rods, which is 72 rods, *Ans.*

Ex. 13. The least common multiple of 11 feet and 15 feet is 15 × 11=165 feet, the distance the carriage must move to bring the rivets up together. Hence, 165 × 574= 94710 feet, the entire distance traveled; and 94710 feet= 17 miles 4950 feet, *Ans.*

CANCELLATION.

(**159**, page 87.)

Ex. 2 $$\frac{\cancel{2}\cancel{1}\times 8\times \cancel{6}\cancel{0}^{5}\times \cancel{9}\times \cancel{6}^{2}}{\cancel{7}\times \cancel{1}\cancel{2}\times \cancel{3}\times \cancel{9}\times \cancel{3}}=80, \textit{Ans.}$$

Ex. 3 $$\frac{\cancel{1}\cancel{6}\times \cancel{5}\times \cancel{1}\cancel{4}^{2}\times \cancel{4}\cancel{0}\times 16\times \cancel{6}\cancel{0}\times \cancel{5}\cancel{0}}{\cancel{4}\cancel{0}\times \cancel{2}\cancel{4}\times \cancel{5}\cancel{0}\times \cancel{2}\cancel{0}\times \cancel{7}\times \cancel{1}\cancel{0}}=32, \textit{Ans.}$$

Ex. 4 $$\frac{\cancel{1}\cancel{2}\times \cancel{5}\times \overset{61}{\cancel{1}\cancel{8}\cancel{3}}\times \cancel{1}\cancel{8}\times \cancel{7}\cancel{0}}{\cancel{3}\times \cancel{1}\cancel{4}\times \cancel{9}\times \cancel{5}\times \cancel{2}\cancel{0}\times \cancel{6}}=61, \textit{Ans.}$$

Ex. 5. $$\frac{\overset{71}{\cancel{213}}\times\cancel{84}\times19\cancel{0}\times\overset{11}{\cancel{264}}}{\cancel{30}\times\cancel{56}\times\cancel{36}}=14839,\ \textit{Ans.}$$

Ex. 6. $$\frac{\cancel{64}\times31\times\cancel{7}\times\cancel{15}\times\cancel{88}\times13}{\cancel{8}\times\cancel{56}\times\cancel{55}\times\cancel{4}\times\cancel{6}}=403,\ \textit{Ans.}$$

Ex. 7. $$\begin{array}{r|l} \cancel{4} & \cancel{12}\ 3 \\ & 3 \\ \hline \end{array}$$

9, *Ans.*

Ex. 8. $$\begin{array}{r|l} & \cancel{195}^{13} \\ \cancel{56} & \cancel{8} \\ \cancel{15} & \cancel{7} \\ \hline \end{array}$$

13, *Ans.*

Ex. 9. $$\begin{array}{r|l} \cancel{99} & 16 \\ \cancel{3} & \cancel{66}\ 2 \\ & \cancel{9} \\ \hline \end{array}$$

32 cents, *Ans.*

Ex. 10. 84+56=140 cents

$$\begin{array}{r|l} & \cancel{480}\ 240 \\ \cancel{140} & \cancel{70} \\ \hline \end{array}$$

240, *Ans.*

Ex. 11. 75×2+90=240 cents, } cost of 2 yards of the first kind, and 1 yard of the second.

$$\begin{array}{r|l} & \cancel{132}^{11} \\ \cancel{240} & \cancel{20} \\ \hline \end{array}$$

11 yards of the second kind; }
11×2=22 " " first " } *Ans*

Ex 12. $$\frac{6\times\overset{5}{\cancel{20}}\times2\times\cancel{44}}{\cancel{8}\times\cancel{22}}=60\text{ cents, }\textit{Ans.}$$

FRACTIONS.

NOTATION AND NUMERATION.

(**169**, page 90.)

Ex. 3. *Ans*. $\frac{16}{45}$. Ex. 4. *Ans*. $\frac{96}{179}$.

Ex. 5 *Ans*. $\frac{536}{400}$. Ex. 6. *Ans*. $\frac{1857}{9521}$.

Ex. 7. *Ans*. $\frac{25000}{87}$. Ex. 8. *Ans*. $\frac{30}{10082}$.

Ex. 9. *Ans*. $\frac{101}{10000000}$.

Ex. 10. Four *ninths;* seven *twelfths;* seventeen *thirty eighths;* forty-five *one hundredths;* seventy-two *three hundred seventy-fifths;* forty-eight *one thousand ninths;* eighty-four *seven thousand eight hundred sixty-thirds;* four hundred fifty-six *five hundred thirty-sevenths.*

Ex. 11. Twenty *fourths;* eighty-seven *thirtieths;* ninety-five *one hundredths;* forty-eight *twelfths;* seventy-five *four hundred thirty-sevenths;* one hundred seventy-five *halves;* four hundred thirty-six *fiftieths;* seven hundred sixty-six *four thousand eight hundred seventy-ninths.*

Ex. 12. Four hundred sixty-seven *nine hundred thirty-sixths;* five hundred thirty-six *two hundred forty-eighths;* ten thousand *seventy-fifths;* seventy-five *ten thousandths;* five thousand seven *three thousand sevenths.*

Ex. 13. One hundred fifty *five hundred thirty-sevenths;* four hundred thirty-six *nine hundred seventy seconds;* thirteen thousand seven hundred eighty-five *forty-seven thousand nine hundred fifty-sixths;* one hundred fifty thousand seventy-two *four hundred seventy-five thousandths;* one hundred thousand one *two hundred thousand seconds.*

(90, 91)

REDUCTION.

(**177**, page 92.)

Ex 6. $\frac{595}{665}=\frac{17}{19}$ *Ans.* Ex. 7. $\frac{258}{282}=\frac{43}{47}$, *Ans.*

Ex. 8. $\frac{639}{1737}=\frac{71}{193}$, *Ans.* Ex. 9. $\frac{5222}{7042}=\frac{373}{503}$, *Ans.*

Ex. 13 $\frac{4489}{5561}=\frac{67}{83}$, *Ans.* Ex. 15. *Ans.* $\frac{1009}{1523}$, $\frac{23583}{23209}$.

(**178**, page 93.)

Ex 2. $\frac{56}{4}=14$, *Ans.* Ex. 7. $\frac{2431}{85}=28\frac{51}{85}=28\frac{3}{5}$, *Ans*

Ex. 9. $\frac{3802}{15}=253\frac{7}{15}$, *Ans.*

Ex. 12. $\frac{10302}{10201}=1\frac{101}{10201}=1\frac{1}{101}$, *Ans.*

(**179**, page 94.)

Ex. 2. $375=\frac{3000}{8}$, *Ans.* Ex. 3. $478=\frac{11472}{24}$, *Ans*

Ex. 4. $36=\frac{324}{9}$, *Ans.*

(**180**, page 95.)

Ex. 3. $57\frac{5}{7}=\frac{404}{7}$, *Ans.* Ex. 5. $872\frac{5}{12}=\frac{10469}{12}$, *Ans*

Ex. 8. $15\frac{7}{8}=\frac{127}{8}$, *Ans.* Ex. 10. $43\frac{3}{4}=\frac{175}{4}$, *Ans.*

Ex. 11. $760\frac{9}{10}=\frac{7609}{10}$, *Ans.*

(**181**, page 96.)

Ex. 1. $24\div3=8$;
$\frac{2}{3}=\frac{16}{24}$, *Ans.*

Ex. 2. $96\div12=8$;
$\frac{7}{12}=\frac{56}{96}$, *Ans.*

Ex. 3. $51\div17=3$;
$\frac{12}{17}=\frac{36}{51}$, *Ans.*

Ex. 4. $78\div13=6$;
$\frac{9}{13}=\frac{54}{78}$, *Ans.*

Ex. 5. $3000\div375=8$;
$\frac{62}{375}=\frac{496}{3000}$, *Ans.*

Ex. 6. $8\div4=2$;
$7\frac{3}{4}=\frac{31}{4}=\frac{62}{8}$, *Ans*

Ex. 7. $16\frac{7}{28}=16\frac{1}{4}=\frac{65}{4}$;
$176\div4=44$; $\frac{65}{4}=\frac{2860}{176}$, *Ans.*

Ex. 8 $363\div11=33$;
$5\frac{3}{11}=\frac{58}{11}=\frac{1914}{363}$, *Ans.*

Ex. 9 $42\div7=6$; $36\frac{5}{7}=\frac{257}{7}=\frac{1542}{42}$, *Ans.*

(182, page 96.)

Ex. 2. $\frac{2}{7}$, $\frac{5}{9}=\frac{18}{63}$, $\frac{35}{63}$, *Ans.*

Ex. 6. $\frac{1}{3}$, $\frac{1}{7}$, $\frac{1}{11}=\frac{77}{231}$, $\frac{33}{231}$, $\frac{21}{231}$, *Ans.*

(184, page 98.)

Ex. 1. $2\times2\times2\times5=40$, least common denominator;
$\frac{5}{8}$, $\frac{3}{10}=\frac{25}{40}$, $\frac{12}{40}$, *Ans.*

Ex. 2. $3\times2\times2=12$, least common denominator;
$\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}=\frac{8}{12}$, $\frac{9}{12}$, $\frac{10}{12}$, *Ans.*

Ex. 3. $5\times3\times2\times2=60$, least common denominator,
$\frac{3}{5}$, $\frac{7}{12}$, $\frac{11}{15}=\frac{36}{60}$, $\frac{35}{60}$, $\frac{44}{60}$, *Ans.*

Ex. 4. $2\times2\times2\times3\times3=72$, least common denominator,
$\frac{2}{3}$, $\frac{8}{9}$, $\frac{3}{8}=\frac{48}{72}$, $\frac{64}{72}$, $\frac{27}{72}$, *Ans.*

Ex. 5. $\frac{6}{14}=\frac{3}{7}$; $\frac{10}{24}=\frac{5}{12}$;

$$\begin{array}{l|l} 7,\ 2 & 7..12..42 \\ \hline 2,\ 3 & \quad 6..\ 3 \end{array}$$

$7\times2\times2\times3=84$, least common denominator.
$\frac{3}{7}$, $\frac{5}{12}$, $\frac{13}{42}=\frac{36}{84}$, $\frac{35}{84}$, $\frac{26}{84}$, *Ans.*

Ex. 6. $13\times3\times2=78$, least common denominator;
$\frac{2}{3}$, $\frac{4}{13}$, $\frac{25}{26}$, $\frac{4}{39}=\frac{52}{78}$, $\frac{24}{78}$, $\frac{75}{78}$, $\frac{8}{78}$, *Ans.*

Ex. 7. $5\times3\times2\times2\times2=120$, least common denominator;
$\frac{13}{5}$, $\frac{7}{15}$, $\frac{5}{24}$, $\frac{37}{60}=\frac{312}{120}$, $\frac{56}{120}$, $\frac{25}{120}$, $\frac{74}{120}$, *Ans.*

Ex. 8. $\frac{51}{84}=\frac{17}{28}$; $7\times2\times2\times2\times3=168$, least com. denom.
$\frac{20}{21}$, $\frac{9}{56}$, $\frac{17}{28}=\frac{160}{168}$, $\frac{27}{168}$, $\frac{102}{168}$, *Ans.*

Ex. 9. $\frac{25}{40}=\frac{5}{8}$; $\frac{25}{120}=\frac{5}{24}$; $\frac{14}{64}=\frac{7}{32}$;

$$\begin{array}{l|l} 2,\ 2,\ 3 & 8..24..32 \\ \hline 2,\ 2,\ 2 & 2..\ 2..\ 8 \end{array}$$

$3\times2^5=96$, least common denominator;
$\frac{5}{8}$, $\frac{5}{24}$, $\frac{7}{32}=\frac{60}{96}$, $\frac{20}{96}$, $\frac{21}{96}$, *Ans.*

Ex. 10. $\frac{38}{247}=\frac{2}{13}$; $\frac{77}{119}=\frac{11}{17}$; $\frac{120}{442}=\frac{60}{221}$;
$13\times17=221$, least common denominator;
$\frac{2}{13}, \frac{11}{17}, \frac{60}{221}=\frac{34}{221}, \frac{143}{221}, \frac{60}{221}$, *Ans.*

Ex. 11. $\frac{161}{529}=\frac{7}{23}$; $\frac{289}{391}=\frac{17}{23}$; $\frac{1147}{1961}=\frac{31}{53}$;
$53\times23=1219$, least common denominator;
$\frac{7}{23}, \frac{17}{23}, \frac{31}{53}=\frac{371}{1219}, \frac{901}{1219}, \frac{713}{1219}$, *Ans.*

Ex. 12. $7\times5\times2=70$, least common denominator;
$\frac{19}{7}, \frac{3}{14}, \frac{17}{10}=\frac{190}{70}, \frac{15}{70}, \frac{119}{70}$, *Ans.*

Ex. 13. $\frac{931}{1829}=\frac{133\times7}{59\times31}$; $\frac{3127}{5723}=\frac{53}{97}$; $\frac{5133}{5626}=\frac{59\times3}{97\times2}=\frac{177}{194}$;
$97\times59\times31\times2=354826$, least com. denom.;
$\frac{931}{1829}, \frac{53}{97}, \frac{177}{194}=\frac{180614}{354826}, \frac{193874}{354826}, \frac{323733}{354826}$, *Ans*

Ex. 14. $2^3\times3^3\times5\times7=7560$, least com. denom.;
$\frac{5}{7}, \frac{11}{12}, \frac{2}{15}, \frac{8}{27}, \frac{9}{35}, \frac{17}{40}=$
$\frac{5400}{7560}, \frac{6930}{7560}, \frac{1008}{7560}, \frac{2240}{7560}, \frac{1944}{7560}, \frac{3213}{7560}$, *Ans.*

Ex 15. $13\times7\times2\times2=364$, least com. denom.;
$\frac{4}{7}, \frac{3}{13}, \frac{5}{28}, \frac{7}{52}, \frac{15}{182}=\frac{208}{364}, \frac{84}{364}, \frac{65}{364}, \frac{49}{364}, \frac{30}{364}$, *Ans*

Ex. 16. $\frac{5}{75}=\frac{1}{15}$; $\frac{32}{56}=\frac{4}{7}$;
$5\times3\times7=105$, least com. denom.;
$\frac{4}{15}, \frac{1}{15}, \frac{4}{7}, \frac{13}{3}=\frac{28}{105}, \frac{7}{105}, \frac{60}{105}, \frac{455}{105}$, *Ans.*

ADDITION.

(186, page 100.)

Ex. 1. $\frac{7+4+5+11}{12}=\frac{27}{12}=2\frac{3}{12}=2\frac{1}{4}$, *Ans.*

Ex. 2. $\frac{13+4+2+8}{15}=\frac{27}{15}=1\frac{4}{5}$, *Ans.*

Ex. 3. $\frac{5+8+16+19}{21}=\frac{48}{21}=2\frac{2}{7}$, *Ans.*

Ex. 4. $7+8+2+5+4 \quad =26$
$\frac{11}{36}+\frac{23}{36}+\frac{17}{36}+\frac{19}{36}+\frac{29}{36}=2\frac{3}{4}$

$28\frac{3}{4}$, *Ans.*

Ex. 5. $37+12+13 \quad =62$

$\frac{9}{56}+\frac{27}{56}+\frac{37}{56}+\frac{53}{56} = \underline{2\frac{1}{4}}$

$64\frac{1}{4}$, *Ans.*

Ex. 6. $\frac{2}{3}+\frac{3}{4}+\frac{5}{6}+=\frac{8+9+10}{12}=\frac{27}{12}=2\frac{1}{4}$, *Ans.*

Ex. 7. $\frac{3}{5}+\frac{4}{7}+\frac{13}{21}+\frac{7}{15}=\frac{63+60+65+49}{105}=\frac{237}{105}=2\frac{9}{35}$, *Ans*

Ex. 8. $\frac{1}{3}+\frac{2}{9}+\frac{1}{15}=\frac{15+10+3}{45}=\frac{28}{45}$, *Ans.*

Ex 9. $\frac{5}{12}+\frac{13}{15}+\frac{7}{20}=\frac{25+52+21}{60}=1\frac{19}{30}$, *Ans.*

Ex. 10. $\frac{1}{3}+\frac{3}{4}+\frac{11}{12}+\frac{29}{42}=\frac{28+63+77+58}{84}=\frac{226}{84}=2\frac{29}{42}$, *Ans.*

Ex. 11. $\frac{7}{8}+\frac{11}{12}+\frac{17}{18}+\frac{23}{24}+\frac{26}{27}=$

$\frac{189+198+204+207+208}{216}=\frac{1006}{216}=4\frac{71}{108}$, *Ans*

Ex. 12. $3+4+2= 9$

$\frac{1}{2}+\frac{2}{3}+\frac{2}{15}=\underline{1\frac{3}{10}}$

$10\frac{3}{10}$, *Ans.*

Ex. 13. $16+24=40$

$\frac{1}{12}+\frac{1}{18}= \underline{\frac{5}{36}}$

$40\frac{5}{36}$, *Ans.*

Ex. 14. $1+2+3+4+5=15$

$\frac{1}{2}+\frac{2}{3}+\frac{3}{4}+\frac{4}{5}+\frac{5}{6}= \underline{3\frac{11}{20}}$

$18\frac{11}{20}$, *Ans.*

Ex. 15. $4+8+2 \quad =14$

$\frac{7}{15}+\frac{5}{21}+\frac{8}{35}= \underline{\frac{14}{15}}$

$14\frac{14}{15}$, *Ans.*

Ex. 16. $\frac{1}{3}+\frac{1}{4}+\frac{1}{12}+\frac{1}{17}=\frac{68+51+17+12}{204}=\frac{37}{51}$. *Ans*

Ex. 17. $\frac{1}{2}+\frac{2}{3}+\frac{2}{13}+\frac{5}{17}=\frac{663+884+204+390}{1326}=1\frac{815}{1326}$, *Ans*

Ex 18 $\frac{1}{2}+\frac{2}{9}+\frac{3}{11}+\frac{7}{18}+\frac{17}{33}=$

$\frac{99+44+54+77+102}{198}=1\frac{89}{99}$, *Ans*

Ex. 19. $\frac{1}{2}+\frac{5}{14}+\frac{3}{19}+\frac{2}{3}=$

$\frac{399+285+336+532}{798}=\frac{1552}{798}. =1\frac{377}{399}$, *Ans*

(100)

Ex. 20. $41+105+300+241+472=1159$

$\frac{1}{2}+\frac{2}{9}+\frac{3}{4}+\frac{3}{5}+\frac{1}{4}=\underline{\quad 2\frac{29}{90}}$

$1161\frac{29}{90}$, *Ans.*

Ex. 21. $4+2+1+2+5+7+4+6=31$

$\frac{1}{8}+\frac{1}{4}+\frac{1}{16}+\frac{5}{24}+\frac{7}{16}+\frac{2}{3}+\frac{1}{2}+\frac{5}{6}=\underline{3\frac{1}{12}}$

$34\frac{1}{12}$, *Ans.*

Ex. 22. $36+42+39+51=168$

$\frac{5}{8}+\frac{2}{3}+\frac{7}{16}+\frac{1}{4}=\underline{\quad 1\frac{47}{48}}$

$169\frac{47}{48}$ pounds, *Ans.*

Ex. 23. $4+3=7$

$\frac{4}{5}+\frac{22}{35}=\underline{1\frac{3}{7}}$

$8\frac{3}{7}$, *Ans.*

Ex. 24. $\frac{5}{18}+\frac{5}{54}=\frac{15+5}{54}=\frac{10}{27}$, *Ans.*

Ex. 25. $\frac{1}{8}+\frac{1}{6}+\frac{1}{5}+\frac{2}{15}=\frac{75}{120}=\frac{5}{8}$ of a dollar, *Ans.*

Ex. 26. $46+64+76=186$

$\frac{4}{9}+\frac{11}{27}+\frac{5}{6}=\underline{\quad 1\frac{37}{54}}$

$187\frac{37}{54}$ yards;

$\$127+\$226+\$312=\$665$

$\$\frac{7}{16}+\$\frac{5}{8}+\$\frac{2}{3}\qquad=\underline{\quad 1\frac{5}{16}}$

$\$666\frac{5}{16}$, received for the whole

SUBTRACTION.

(**188**, page 102.)

Ex. 1. $\frac{7-3}{15}=\frac{4}{15}$, *Ans.* Ex. 2. $\frac{35-21}{56}=\frac{14}{56}=\frac{1}{4}$, *Ans*

Ex. 3. $\frac{35-9}{52}=\frac{26}{52}=\frac{1}{2}$, *Ans.*

Ex 4. $\frac{5}{6}-\frac{3}{8}=\frac{20-9}{24}=\frac{11}{24}$, *Ans.*

Ex 5. $\frac{3}{4}-\frac{7}{20}=\frac{15-7}{20}=\frac{8}{20}=\frac{2}{5}$, *Ans.*

Ex. 6. $\frac{13}{15}-\frac{7}{24}=\frac{104-35}{120}=\frac{69}{120}=\frac{23}{40}$, *Ans.*

Ex. 7. $\frac{9}{14}-\frac{16}{63}=\frac{81-32}{126}=\frac{49}{126}=\frac{7}{18}$, *Ans.*

Ex. 8. $\frac{14}{39}-\frac{19}{65}=\frac{70-57}{195}=\frac{13}{195}=\frac{1}{15}$, *Ans.*

Ex 9. $\frac{5}{21}-\frac{1}{15}=\frac{25-7}{105}=\frac{18}{105}=\frac{6}{35}$, *Ans.*

Ex 10. $\frac{7}{12}-\frac{5}{42}=\frac{49-10}{84}=\frac{39}{84}=\frac{13}{28}$, *Ans.*

Ex. 11. $\frac{7}{64}-\frac{13}{120}=\frac{105-104}{960}=\frac{1}{960}$, *Ans.*

Ex. 12. $\frac{9}{35}-\frac{7}{30}=\frac{54-49}{210}=\frac{1}{42}$, *Ans.*

Ex. 13. $16\frac{5}{6}$
$7\frac{1}{6}$
$9\frac{4}{6}=9\frac{2}{3}$, *Ans.*

Ex. 14. $36\frac{11}{24}$
$8\frac{19}{24}$
$27\frac{16}{24}=27\frac{2}{3}$, *Ans.*

Ex. 15. $25\frac{7}{10}=25\frac{21}{30}$
$14\frac{13}{15}=14\frac{26}{30}$
$10\frac{25}{30}=10\frac{5}{6}$, *Ans.*

Ex. 16. 75
$4\frac{3}{7}$
$70\frac{4}{7}$, *Ans*

Ex. 17. $18\frac{2}{9}=18\frac{4}{18}$
$5\frac{5}{6}=5\frac{15}{18}$
$12\frac{7}{18}$, *Ans.*

Ex. 18. $26\frac{7}{24}=26\frac{35}{120}$
$25\frac{13}{15}=25\frac{104}{120}$
$\frac{51}{120}=\frac{17}{40}$, *Ans*

Ex. 19 $28\frac{16}{63}=28\frac{32}{126}$
$3\frac{9}{14}=3\frac{81}{126}$
$24\frac{77}{126}=24\frac{11}{18}$, *Ans.*

Ex. 20 $78\frac{7}{15}=78\frac{7}{15}$
$32\frac{2}{3}=32\frac{10}{15}$
$45\frac{12}{15}=45\frac{4}{5}$, *Ans.*

Ex 21 $36\frac{1}{4}-7\frac{1}{13}=19\frac{9}{52}$, *Ans.*

Ex 22 $97\frac{8}{9}-18\frac{4}{7}=79\frac{20}{63}$, *Ans.*

Ex 23 $126\frac{1}{7}+240\frac{3}{4}=366\frac{25}{28}$;
$560\frac{5}{8}-366\frac{25}{28}=193\frac{41}{56}$, *Ans*

Ex. 24. $\frac{1}{8}+\frac{1}{12}+\frac{1}{18}=\frac{19}{72}$; $\frac{25}{36}-\frac{19}{72}=\frac{31}{72}$, *Ans.*

Ex. 25. $\frac{8}{9}-\frac{2}{5}=\frac{22}{45}$, *Ans.*

Ex. 26. $31\frac{1}{2}-14\frac{7}{8}=16\frac{5}{8}$ gallons, *Ans.*

Ex. 27. $\$140\frac{3}{8}$ $\qquad$ $\$\ 775\frac{1}{3}$

$456\frac{2}{3}$ $\qquad$ $516\frac{3}{16}$

$\$597\frac{1}{24}$, bought for; $\$1291\frac{25}{48}$, sold for;

$\$1291\frac{25}{48}-\$597\frac{1}{24}=\$694\frac{23}{48}$, *Ans*

MULTIPLICATION.

(**193**, page 105.)

Ex. 1. $\frac{3}{9}\times\frac{8}{1}=\frac{8}{3}=2\frac{2}{3}$, *Ans.*

Ex. 2. $\frac{4}{9}\times\frac{27}{1}=12$; $\frac{3}{16}\times\frac{4}{1}=\frac{3}{4}$; $\frac{5}{36}\times\frac{9}{1}=\frac{5}{4}=1\frac{1}{4}$.

Ex. 3. $\frac{2}{75}\times\frac{15}{1}=\frac{2}{5}$, *Ans.* Ex. 4. $\frac{8}{1}\times\frac{3}{4}=6$, *Ans*

Ex. 5. $\frac{75}{1}\times\frac{3}{15}=15$; $\frac{7}{1}\times\frac{8}{21}=\frac{8}{3}=2\frac{2}{3}$; $\frac{756}{1}\times\frac{5}{6}=630$; $\frac{572}{1}$ $\times\frac{5}{24}=119\frac{1}{6}$.

Ex. 6. $\frac{3}{7}\times\frac{5}{6}=\frac{5}{14}$, *Ans.*

Ex. 7. $\frac{11}{15}\times\frac{20}{33}=\frac{4}{9}$; $\frac{15}{17}\times\frac{51}{75}=\frac{3}{5}$.

Ex. 8. $\frac{7}{12}\times\frac{17}{42}=\frac{17}{72}$; $\frac{8}{35}\times\frac{21}{20}=\frac{6}{25}$.

Ex. 9. $\frac{18}{7}\times\frac{35}{9}=10$, *Ans.* Ex. 10. $\frac{9}{7}\times\frac{35}{18}=\frac{5}{2}=2\frac{1}{2}$, *Ans*

Ex. 11. $\frac{9}{17}\times\frac{85}{36}=\frac{5}{4}=1\frac{1}{4}$, *Ans.*

Ex. 12. $\frac{2}{3}\times\frac{5}{6}\times\frac{9}{15}\times\frac{7}{8}=\frac{7}{24}$, *Ans.*

Ex. 13. $\frac{2}{3}\times\frac{7}{8}\times\frac{15}{28}\times\frac{4}{11}\times\frac{44}{75}=\frac{1}{15}$, *Ans.*

Ex. 14. $\frac{34}{35}\times\frac{7}{53}\times\frac{106}{119}=\frac{4}{35}$, *Ans.*

Ex. 15. $\frac{12}{5}\times\frac{18}{7}\times\frac{2}{11}\times\frac{5}{108}\times\frac{22}{15}\times\frac{105}{4}=2$, *Ans.*

Ex. 16. $\frac{7}{11}\times\frac{5}{21}\times\frac{22}{5}\times\frac{15}{1}\times\frac{3}{16}=\frac{15}{8}=1\frac{7}{8}$, *Ans*

Ex. 17. $\frac{43}{126}\times\frac{7}{860}\times\frac{540}{53}=\frac{3}{106}$, *Ans.*

Ex. 18. $4\frac{1}{2}\times\frac{7}{8}=3\frac{15}{16}$; $3\frac{15}{16}\times1\frac{3}{5}=5\frac{43}{80}$; $3\frac{1}{3}-\frac{9}{10}=2\frac{13}{30}$;

$5\frac{43}{80}\times2\frac{13}{30}=\frac{32339}{2400}=13\frac{1139}{2400}$, *Ans.*

Ex. 19 $7\frac{3}{4}-2\frac{2}{5}=5\frac{7}{20}$; $\frac{4}{5}+\frac{1}{3}=1\frac{2}{15}$;
$5\frac{7}{20}\times\frac{5}{6}\times1\frac{2}{15}=5\frac{19}{360}$; $5\frac{19}{360}+28=33\frac{19}{360}$: *Ans.*

Ex. 20. $\frac{1}{3}\times\frac{4}{5}\times\frac{5}{6}=\frac{2}{9}$, *Ans.* **Ex. 21.** $\frac{2}{3}\times\frac{7}{8}\times\frac{3}{21}=\frac{1}{12}$, *Ans.*

Ex. 22. $\frac{5}{8}\times\frac{4}{15}\times\frac{6}{7}=\frac{1}{7}$, *Ans.*

Ex. 23. $\frac{11}{12}\times\frac{6}{33}\times\frac{15}{35}\times\frac{21}{28}=\frac{3}{56}$, *Ans.*

Ex. 24. $\frac{1}{2}\times\frac{2}{3}\times\frac{3}{4}\times\frac{4}{5}\times\frac{5}{6}\times\frac{6}{7}\times\frac{7}{8}\times\frac{8}{9}\times\frac{9}{10}=\frac{1}{10}$, *Ans.*

Ex. 25 $\frac{901}{713}=\frac{53\times17}{31\times23}$; $\frac{1219}{1343}=\frac{53\times23}{79\times17}$; $\frac{2449}{5353}=\frac{79\times31}{101\times53}$;
$\frac{53\times17}{31\times23}\times\frac{53\times23}{79\times17}\times\frac{79\times31}{101\times53}=\frac{53}{101}$, *Ans.*

Ex. 26. $\frac{61\times41}{59\times43}\times\frac{67\times43}{83\times41}\times\frac{83\times59}{97\times67}=\frac{61}{97}$, *Ans.*

Ex. 27. $\frac{47\times157}{97\times103}\times\frac{97\times97}{47\times179}\times\frac{83\times103}{97\times101}=\frac{13031}{18079}$, *Ans.*

Ex. 28. $\$3\frac{5}{8}\times7=\$25\frac{3}{8}$, *Ans.*

Ex. 29. $\frac{3}{4}\times\frac{3}{4}\times\frac{16}{21}\times\frac{1}{5}\times\frac{1}{5}\times\frac{1}{5}\times\frac{1}{5}\times\frac{1}{5}=\frac{3}{21875}$, *Ans.*

Ex. 30. $\frac{3}{7}\times10\times6=25\frac{5}{7}$, *Ans.*

Ex. 31. $\frac{103}{8}\times\frac{103}{8}\times\frac{103}{8}\times\frac{1092727}{512}=2134\frac{119}{512}$, *Ans.*

Ex. 32. $\$9\frac{3}{5}\times\frac{1}{2}\times\frac{5}{6}=\$4$, *Ans.*

Ex. 33. $\$\frac{9}{16}\times1\frac{3}{5}=\$\frac{9}{10}$, *Ans.* **Ex. 34.** $\$\frac{7}{8}\times\frac{4}{7}=\$\frac{1}{2}$, *Ans.*

Ex. 35. $156\frac{2}{3}\times\frac{4}{5}\times\frac{1}{2}\times\frac{3}{4}=47$, *Ans.*

Ex. 36. $\frac{3}{8}\times\frac{3}{8}\times\frac{3}{8}\times\frac{1}{2}\times\frac{1}{2}\times\frac{9}{10}\times\frac{9}{10}\times\frac{10}{3}\times\frac{10}{3}\times\frac{10}{3}\times\frac{10}{3}$.
$=\frac{675}{512}$, *Ans*

Ex. 37. $1\frac{7}{9}\times6\times8\frac{9}{10}=94\frac{14}{15}$, *Ans.*

Ex. 38. $\frac{6}{7}\times121\frac{4}{5}=104\frac{2}{5}$; $\frac{3}{4}\times48\frac{2}{3}=36\frac{1}{2}$;
$104\frac{2}{5}+36\frac{1}{2}-75=65\frac{9}{10}$;
$150\frac{1}{2}-65\frac{9}{10}=84\frac{3}{5}$, **multiplicand;**
$\frac{4}{5}\times1\frac{1}{8}\times4=3\frac{3}{5}$; $3\frac{3}{5}-2\frac{1}{4}=1\frac{7}{20}$;
$1\frac{7}{20}\times3=4\frac{1}{20}$, **multiplier;**
$84\frac{3}{5}\times4\frac{1}{20}=342\frac{63}{100}$, *Ans.*

Ex. 39. $\frac{1}{2}\times\frac{5}{6}\times\frac{5}{7}=\frac{25}{84}$, *Ans.*

Ex. 40. $\frac{5}{6}-(\frac{3}{4}\times\frac{5}{6})=\frac{5}{24}$, **A's share;**
$\frac{3}{4}\times\frac{5}{6}-(\frac{1}{2}\times\frac{3}{4}\times\frac{5}{6})=\frac{5}{16}$, **B's share;**
$\frac{1}{2}\times\frac{3}{4}\times\frac{5}{6}-(\frac{2}{3}\times\frac{1}{2}\times\frac{3}{4}\times\frac{5}{6})=\frac{5}{48}$, **C's** share;
$\frac{2}{3}\times\frac{1}{2}\times\frac{3}{4}\times\frac{5}{6}=\frac{5}{24}$, **D's share.**

(106, 107)

Ex. 41. $2\frac{1}{4}\times\frac{1}{5}=\frac{9}{20}$; $\frac{5}{6}\times4\frac{1}{4}\times(\frac{2}{5})^2=\frac{17}{30}$; $(3\frac{2}{3})^3-(3\frac{2}{3})^2$ $=35\frac{23}{27}$; $\frac{9}{20}+\frac{17}{30}+35\frac{23}{27}=36\frac{469}{540}$, *Ans.*

DIVISION.

(**195**, page 108.)

Ex 2 $\frac{10}{11}\times\frac{1}{5}=\frac{2}{11}$; $\frac{128}{135}\times\frac{1}{80}=\frac{8}{675}$.

Ex 3. $\frac{10}{1}\times\frac{7}{2}=35$, *Ans.*

Ex. 4. $\frac{28}{1}\times\frac{4}{3}=\frac{112}{3}=37\frac{1}{3}$; $\frac{3}{1}\times\frac{12}{5}=\frac{36}{5}=7\frac{1}{5}$.

Ex 5. $\frac{56}{1}\times\frac{9}{14}=36$, *Ans.* Ex. 6. $\frac{15}{24}\times\frac{6}{5}=\frac{3}{4}$, *Ans.*

Ex 7. $\frac{16}{27}\times\frac{9}{8}=\frac{2}{3}$; $\frac{12}{55}\times\frac{77}{9}=\frac{28}{15}=1\frac{13}{15}$; $\frac{23}{6}\times\frac{9}{46}=\frac{3}{4}$.

Ex. 8. $\frac{15}{8}\times\frac{8}{9}=\frac{5}{3}=1\frac{2}{3}$, *Ans.*

Ex 9. $\frac{105}{91}\times\frac{52}{35}=\frac{12}{7}=1\frac{5}{7}$, *Ans.*

Ex. 11. $\frac{4}{9}\times\frac{5}{11}\times\frac{11}{8}\times\frac{18}{5}=1$, *Ans.*

Ex. 12 $\frac{7}{12}\times\frac{8}{13}\times\frac{9}{7}\times\frac{21}{5}=\frac{126}{65}=1\frac{61}{65}$, *Ans.*

Ex. 13. $\frac{5}{2}\times\frac{36}{5}\times\frac{3}{10}\times\frac{10}{33}=\frac{18}{11}=1\frac{7}{11}$, *Ans.*

Ex 14. $\frac{11}{1}\times\frac{3}{2}\times\frac{2}{11}\times\frac{1}{7}=\frac{3}{7}$, *Ans.*

Ex 15. $\frac{13}{4}\times\frac{19}{1}\times\frac{5}{1}\times\frac{5}{38}\times\frac{8}{13}=25$, *Ans.*

Ex. 16. $\frac{5}{12}\times\frac{18}{25}\times\frac{2}{1}\times\frac{8}{7}\times\frac{17}{5}\times\frac{35}{34}\times\frac{72}{51}=3\frac{33}{85}$, *Ans.*

Ex. 17. $\frac{391}{589}\times\frac{1178}{667}=\frac{17\times23}{19\times31}\times\frac{2\times19\times31}{23\times29}=\frac{34}{29}=1\frac{5}{29}$, *Ans.*

Ex. 18. $\frac{13\times13\times31}{7\times59\times67}\times\frac{59}{31}\times\frac{56}{39}\times\frac{67}{64}=\frac{13}{24}$, *Ans.*

Ex. 19 $\frac{1}{2}\times\frac{2}{3}\times\frac{3}{4}\times\frac{4}{5}\times\frac{6}{5}\times\frac{7}{6}\times\frac{8}{7}\times\frac{9}{8}\times\frac{10}{9}=\frac{2}{5}$, *Ans.*

Ex. 22. $\dfrac{\frac{2}{3}\times\frac{11}{12}}{\frac{1}{18}\times5\frac{1}{2}}=\frac{2}{3}\times\frac{11}{12}\times\frac{18}{1}\times\frac{2}{11}=2$, *Ans.*

Ex. 23. $7+3\frac{5}{8}=10\frac{5}{8}$; $\dfrac{10\frac{5}{8}}{1\frac{5}{12}}=\frac{85}{8}\times\frac{12}{17}=\frac{15}{2}=7\frac{1}{2}$, *Ans.*

Ex. 24. $\frac{3}{4}-\frac{3}{5}=\frac{3}{20}$; $\frac{1}{3}+\frac{3}{8}=\frac{17}{24}$; $\dfrac{\frac{3}{20}}{\frac{17}{24}}=\frac{3}{20}\times\frac{24}{17}=\frac{18}{85}$, *Ans.*

Ex. 25. $\frac{5}{7}-\frac{2}{3}=\frac{1}{21}$ $\dfrac{\frac{1}{21}}{\frac{1}{3}\times\frac{2}{7}}=\frac{1}{21}\times\frac{3}{1}\times\frac{7}{2}=\frac{1}{2}$, *Ans.*

Ex. 26. $6\frac{1}{5}-5\frac{4}{15}=\frac{14}{15}$; $\dfrac{\frac{5}{9}\times\frac{3}{7}}{\frac{14}{15}}=\frac{5}{9}\times\frac{3}{7}\times\frac{15}{14}=\frac{25}{98}$, *Ans.*

Ex. 27. $\$\frac{4}{5}\div 7=\$\frac{4}{5}\times\frac{1}{7}=\frac{4}{35}$, *Ans.*

Ex 28. $\$6\frac{1}{2}\div\$\frac{3}{8}=\frac{13}{2}\times\frac{8}{3}=\frac{52}{3}=17\frac{1}{3}$, *Ans.*

Ex. 29. $\$30\div\frac{4}{9}=\$\frac{30}{1}\times\frac{9}{4}=\$\frac{135}{2}=\$67\frac{1}{2}$, *Ans.*

Ex. 30. $\$\frac{9}{10}\div(\frac{1}{2}\times\$\frac{3}{4})=\frac{9}{10}\times\frac{2}{1}\times\frac{4}{3}=\frac{12}{5}=2\frac{2}{5}$ pints, *Ans.*

Ex. 31. $\$2\frac{1}{6}\div\frac{3}{10}=\$\frac{13}{6}\times\frac{10}{3}=\$\frac{65}{9}=\$7\frac{2}{9}$, *Ans.*

Ex. 32 $\$\frac{30}{1}\times\frac{1}{3}\times\frac{2}{5}\times\frac{5}{1}\times\frac{3}{13}=\$\frac{60}{13}=\$4\frac{8}{13}$, *Ans.*

Ex. 33. $(\$1725\frac{3}{8}\div 235\frac{1}{2})\times 125\frac{1}{3}=$
$\$\frac{13803}{8}\times\frac{2}{471}\times\frac{376}{3}=\$918\frac{116}{471}$, *Ans.*

Ex. 34. $26\frac{1}{4}\div\frac{5}{6}=\frac{105}{4}\times\frac{6}{5}=\frac{63}{2}=31\frac{1}{2}$, *Ans.*

Ex. 35. $27\div 2\frac{5}{9}=\frac{27}{1}\times\frac{9}{23}=\frac{243}{23}=10\frac{13}{23}$, *Ans.*

Ex. 36. $148\frac{3}{4}\div 16\frac{11}{12}=\frac{595}{4}\times\frac{12}{203}=\frac{255}{29}=8\frac{23}{29}$, *Ans.*

Ex. 37. $\frac{7}{9}\times\frac{8}{3}\times\frac{6}{5}\times\frac{1}{2}=\frac{56}{45}=1\frac{11}{45}$, *Ans.*

Ex. 38. $28-7\frac{1}{2}=20\frac{1}{2}$; $20\frac{1}{2}\times\frac{5}{8}=12\frac{13}{16}$; $720-12\frac{13}{16}=$
$707\frac{3}{16}$; $\frac{9}{10}\div\frac{3}{5}=1\frac{1}{2}$; $40\frac{1}{4}+1\frac{1}{2}=41\frac{3}{4}$; $41\frac{3}{4}\times$
$(\frac{1}{2})^4=2\frac{39}{64}$; $707\frac{3}{16}\div 2\frac{39}{64}=\frac{11315}{16}\times\frac{64}{167}=\frac{45260}{167}=$
$271\frac{3}{167}$, *Ans.*

Ex. 39 $3\frac{1}{2}\times(\frac{2}{5})^2=\frac{14}{25}$; $\frac{3}{4}\times\frac{1}{3}=\frac{1}{4}$; $\frac{14}{25}+\frac{1}{4}=\frac{81}{100}$;
$\overline{\frac{2}{7}\div(\frac{2}{3})^3}\times 5=4\frac{23}{28}$; $17\frac{1}{8}-\frac{3}{5}+4\frac{23}{28}=21\frac{97}{280}=\frac{5977}{280}$;
$\frac{81}{100}\times\frac{81}{100}\times\frac{81}{100}\times\frac{280}{5977}=\frac{3720087}{149425000}$, *Ans.*

Ex 40 $\frac{1}{3}\times\frac{8}{125}\times\frac{13}{4}\times\frac{2}{1}\times\frac{4}{37}\times\frac{4}{37}\times\frac{81}{16}\times\frac{8}{11}\times\frac{8}{1}\times\frac{4}{3}\times\frac{3}{16}$
$=\frac{22464}{1882375}$, *Ans.*

GREATEST COMMON DIVISOR OF FRACTIONS.

(**198**, page 112.)

Ex. 1 The greatest common divisor of 7, 14, and 28 is 7 the least common multiple of 9, 27, and 45 is 135

Ans. $\frac{7}{135}$

Ex 2. $3\frac{1}{5}$, $1\frac{5}{7}$, $\frac{24}{35}=\frac{16}{5}$, $\frac{12}{7}$, $\frac{24}{35}$;
the greatest common divisor of 16, 12, and 24 is 4;
the least common multiple of 5, 7, and 35 is 35;

Ans. $\frac{4}{35}$

Ex. 3. 4, $2\frac{2}{9}$, $2\frac{2}{5}$, $\frac{4}{90}=\frac{4}{1}$, $\frac{20}{9}$, $\frac{12}{5}$, $\frac{2}{45}$;
greatest common divisor of 4, 20, 12, and 2 is 2;
least common multiple of 1, 9, 5, and 45 is 45;

Ans. $\frac{2}{45}$

Ex. 4. $109\frac{1}{5}$, $122\frac{4}{7}=\frac{546}{5}$, $\frac{858}{7}$;
greatest common divisor of 546 and 858 is 78;
least common multiple of 5 and 7 is 35;

$\frac{78}{35}=2\frac{8}{35}$, *Ans.*

Ex. 5. The measure will be the greatest common divisor of $18\frac{2}{5}$ feet and $57\frac{1}{2}$ feet, which is $2\frac{3}{10}$ feet, *Ans.*

Ex. 6. The greatest common divisor of $134\frac{3}{4}$ gallons, $128\frac{1}{3}$ gallons, and $115\frac{1}{2}$ gallons, is $6\frac{5}{12}$ gallons, the capacity of the casks required. Hence,

$134\frac{3}{4}\div6\frac{5}{12}=21$, number of casks for the first kind;
$128\frac{1}{3}\div6\frac{5}{12}=20$, " " " second "
$115\frac{1}{2}\div6\frac{5}{12}=18$, " " " third "

59, *Ans.*

LEAST COMMON MULTIPLE OF FRACTIONS.

(**201**, page 113.)

Ex. 1. The least common multiple of 2, 7, 14, and 8 is 56; the greatest common divisor of 5, 10, 15, and 25 is 5; $\frac{56}{5}=11\frac{1}{5}$, *Ans.*

Ex. 2. The least common multiple of 7, 35, and 49 is 245; the greatest common divisor of 24, 36, and 60 is 12; $\frac{245}{12}=20\frac{5}{12}$, *Ans*

Ex. 3. $2\frac{22}{25}$, $1\frac{37}{75}$, $\frac{63}{100}=\frac{72}{25}$, $\frac{112}{75}$, $\frac{63}{100}$; least common multiple of 72, 112, and 63 is 1008, greatest common divisor of 25, 75 and 100 is 25; $\frac{1008}{25}=40\frac{8}{25}$, *Ans.*

Ex. 4. Least common multiple of 1, 2, 3, 4, 5, 6, 7, 8, 9, is 2520; greatest common divisor of 2, 3, 4, 5, 6, 7, 8, 9, 10, is 1. *Ans.* 2520.

Ex 5 The train must move a distance equal to the least common multiple of $15\frac{5}{18}$ feet and $9\frac{3}{8}$ feet, which is $459\frac{3}{8}$ feet, *Ans.*

PROMISCUOUS EXAMPLES

(Page 114.)

Ex. 1. $\frac{7}{9}\times\frac{5}{7}=\frac{5}{9}$; $135\div9=15$; $\frac{5}{9}=\frac{75}{135}$, *Ans.*

Ex. 2. $48\div4=12$; $48\div6=8$; $48\div8=6$; $48\div12=4$; $\frac{3}{4}$, $\frac{1}{6}$, $\frac{5}{8}$, $\frac{11}{12}=\frac{36}{48}$, $\frac{8}{48}$, $\frac{30}{48}$, $\frac{44}{48}$, *Ans.*

Ex. 3. $1\frac{1}{3}$, $\frac{6}{7}$ 2, $\frac{7}{10}$, $\frac{2}{3}$ of $\frac{4}{5}$, $\frac{4}{9}$ of $\frac{1}{4}=\frac{4}{3}$, $\frac{6}{7}$, $\frac{2}{1}$, $\frac{7}{10}$, $\frac{8}{15}$, $\frac{1}{9}$; $3\times5\times3\times2\times7=630$, *Ans.*

Ex 4. $\dfrac{\frac{2}{3}\times\frac{3}{4}}{\frac{1}{2}}=1$; $\dfrac{\frac{2}{5}\times\frac{5}{6}}{\frac{2}{9}\times4\frac{1}{2}}=\frac{1}{3}$;
$1+\frac{1}{3}$; $=1\frac{1}{3}$; $1-\frac{1}{3}=\frac{2}{3}$; $1\frac{1}{3}\div\frac{2}{3}=2$, *Ans.*

Ex. 5. $\dfrac{54\frac{3}{5}}{\frac{1}{5}\times8\frac{2}{3}}=31\frac{1}{2}$; $\dfrac{1\frac{5}{9}}{\frac{9}{16}}=2\frac{62}{81}$; $31\frac{1}{2}+2\frac{62}{81}=34\frac{43}{162}$, *Ans.*

Ex 6 $\frac{23}{84}\times\frac{9}{2}\times\frac{8}{5}\times\frac{7}{23}=\frac{3}{5}$, *Ans.*

Ex. 7. $\dfrac{2-\frac{1}{4}}{2}\times\dfrac{(8\frac{4}{7})^2}{12}=\frac{7}{8}\times\frac{60}{7}\times\frac{60}{7}\times\frac{1}{12}=5\frac{5}{14}=5\frac{50}{140}$;
$(2+\frac{1}{5})\div(3+\frac{1}{7})=\frac{11}{5}\times\frac{7}{22}=\frac{7}{10} \qquad = \frac{98}{140}$;
$\dfrac{11\frac{3}{32}}{8\frac{7}{8}}=\frac{355}{32}\times\frac{8}{71}=1\frac{1}{4} \qquad =1\frac{35}{140}$;
$7\frac{43}{140}$, *Ans.*

Ex. 8. $\frac{7}{9}-\frac{2}{7}=\frac{31}{63}$. A number diminished by $\frac{31}{63}$ of itself will leave a remainder of $1-\frac{31}{63}=\frac{32}{63}$ of itself; hence, $144\div\frac{32}{63}=283\frac{1}{2}$, *Ans.*

Ex. 9. $\frac{1}{3}+\frac{2}{5}+\frac{1}{8}=\frac{103}{120}$; $1-\frac{103}{120}=\frac{17}{120}$ of his money left; hence, $\$119\div\frac{17}{120}=\$840$, *Ans.*

Ex. 10. $\$42\times\frac{4}{29}\times\frac{1}{2}\times\frac{87}{8}=\$31\frac{1}{2}$, *Ans.*

Ex. 11 Since the less is $\frac{5}{7}$ of the greater, their difference is $\frac{7}{7}-\frac{5}{7}=\frac{2}{7}$ of the greater; hence, $25\frac{7}{15}\div\frac{2}{7}=89\frac{2}{15}$, the greater number; $89\frac{2}{15}-25\frac{7}{15}=63\frac{2}{3}$, the less.

Ex 12. The two shares together must be $\frac{9}{9}+\frac{7}{9}=\frac{16}{9}$ times the greater share; hence, $\$2000\div\frac{16}{9}=\$1125$, the greater share; $\$2000-\$1125=\$875$, the less share.

Ex 13. $\frac{4}{1}\times\frac{5}{3}\times\frac{3}{2}=10$, *Ans.*

Ex. 14. $\$\frac{65}{6}\div\$\frac{7}{9}=13\frac{13}{14}$, *Ans.*

Ex 15 $\frac{22}{3}\times\frac{2}{3}\times\frac{5}{2}=12\frac{2}{9}$, *Ans.*

Ex. 16 $\frac{15}{1}\times\frac{3}{2}$=bushels of corn that can be bought for $15;
$\frac{15}{1}\times\frac{3}{2}\times\frac{4}{3}\times\frac{3}{5}=18$ bushels of barley, *Ans.*

Ex. 17. $\frac{48}{1}\times\frac{7}{5}\times\frac{3}{4}=50\frac{2}{5}$, *Ans.*

Ex. 18 $\frac{41}{2}\times\frac{5}{4}=$ the number of yards of cloth 1 yard wide;
$\frac{41}{2}\times\frac{5}{4}\times\frac{4}{3}=34\frac{1}{6}$ yards, *Ans.*

Ex 19 $\frac{5}{8}\times\frac{4}{5}=\frac{1}{2}$ of the foundery sold for \$$2570\frac{2}{3}$;
hence, \$$2570\frac{2}{3}\times2=$ \$$5141\frac{1}{3}$, *Ans.*

Ex. 20. \$$10000\times\frac{1}{4}\times\frac{4}{5}\times\frac{12}{7}\times\frac{9}{4}\times\frac{7}{5}\times\frac{10}{9}=$ \$12000, vessel;
\$10000 + \$12000 = \$22000, *Ans.*

Ex. 21. The second son had $\frac{2}{3}$ of $\frac{5}{8}=\frac{5}{12}$; the third son had $1-(\frac{3}{8}+\frac{5}{12})=\frac{5}{24}$; the difference between the shares of the first and second is $\frac{5}{12}-\frac{3}{8}=\frac{1}{24}$; hence, \$500 $\div\frac{1}{24}=$ \$12000, whole estate; \$$12000\times\frac{5}{24}=$ \$2500, third son's share.

Ex. 22. \$$\frac{60}{1}\times\frac{2}{15}=$ \$8, cost of 1 ton; \$78 ÷ \$8 $=9\frac{3}{4}$, *Ans.*

Ex. 23. $16\frac{1}{2}\div30=\frac{33}{2}\times\frac{1}{30}=\frac{11}{20}$, *Ans.*

Ex. 24. $\frac{3}{8}$ of the whole $+12\frac{1}{4}$ acres $=$ 1st and 2d sons' shares;
$\frac{3}{8}$ " " " $+12\frac{1}{4}$ " $=$ 3d son's share,
$\frac{3}{4}$ of the whole $+24\frac{1}{2}$ " $=$ the whole; therefore, $24\frac{1}{2}$ acres must be $\frac{1}{4}$ of the whole; $24\frac{1}{2}\times4=98$ acres, the whole; and $98\times\frac{3}{8}+12\frac{1}{4}=49$ acres, *Ans.*

Ex. 25. \$$\frac{9}{2}\times\frac{4}{3}\times\frac{1}{6}\times\frac{4}{5}=$ \$$\frac{4}{5}$, *Ans.*

Ex. 26. \$3500 − \$740 = \$2760, his money before gaining; hence, \$$2760\div\frac{3}{5}=$ \$4600, money invested; and \$$4600\times\frac{2}{5}=$ \$1840, lost, *Ans.*

Ex. 27. $\frac{2}{5}$ of $\frac{5}{8}=\frac{1}{4}$, *Ans.*

Ex. 28. Since A can do $\frac{1}{8}$ of the work in 1 day, and B can do $\frac{1}{6}$ of it in 1 day, they can both do $\frac{1}{8}+\frac{1}{6}=\frac{7}{24}$ of the work in 1 day; and if $\frac{7}{24}$ be done in 1 day, $\frac{24}{24}$, or the whole work, will require $\frac{24}{7}=3\frac{3}{7}$ days, *Ans.*

NOTE.—The time required to perform any piece of work will always be the reciprocal of that fraction of the work performed in 1 unit of time.

Ex. 29. $\frac{65}{2} \times \frac{8}{5} \times \frac{1}{4} = 13$ barrels, sold at \$4 per barrel; $13 + 5 = 18$ barrels, *Ans.*

Ex. 30. The number will be the least common multiple of $\frac{5}{6}$, $\frac{3}{8}$, $\frac{6}{7}$ and $\frac{4}{5}$, which is 60, *Ans.*

Ex. 31. According to the note above, A will travel round the island, and be again at the point of starting, once in $\frac{7}{2}$ days, B once in $\frac{17}{4}$ days, and C once in $\frac{51}{8}$ days; and the least common multiple of $\frac{7}{2}$ days, $\frac{17}{4}$ days, and $\frac{51}{8}$ days, is $\frac{357}{2} = 178\frac{1}{2}$ days, *Ans.*

Ex. 32. The sum of the distances traveled by the two men is $64\frac{3}{4}$ miles, and the difference of these distances is $5\frac{1}{2}$ miles. Hence, by Problem 33, page 64, of the Arithmetic, we have
$64\frac{3}{4} + 5\frac{1}{2} = 70\frac{1}{4}$; $70\frac{1}{4} \div 2 = 35\frac{1}{8}$ miles, the greater journey; $64\frac{3}{4} - 5\frac{1}{2} = 59\frac{1}{4}$; $59\frac{1}{4} \div 2 = 29\frac{5}{8}$ miles, the less journey.

Ex. 33. $1\frac{1}{10} + \frac{2}{5} = 1\frac{1}{2}$; $1\frac{1}{2} \div 2 = \frac{3}{4}$, the greater;
$1\frac{1}{10} - \frac{2}{5} = \frac{7}{10}$; $\frac{7}{10} \div 2 = \frac{7}{20}$, the less.

Ex. 34. $1 - \frac{13}{126} = \frac{113}{126}$, the *sum* of B's and C's shares. And since $\frac{7}{18}$ is the *difference* of B's and C's shares, we have $\frac{113}{126} + \frac{7}{18} = \frac{9}{7}$; $\frac{9}{7} \div 2 = \frac{9}{14}$, B's share;
$\frac{113}{126} - \frac{7}{18} = \frac{32}{63}$; $\frac{32}{63} \div 2 = \frac{16}{63}$, C's share.

Ex. 35 The reciprocal of $\frac{4}{5}$ is $\frac{5}{4}$;
reversing the fourth operation, $\frac{5}{4} \times \frac{6}{25} = \frac{3}{10}$;
reversing the third operation, $\frac{3}{10} + \frac{2}{5} = \frac{7}{10}$;
reversing the second operation, $\frac{7}{10} - \frac{1}{6} = \frac{8}{15}$;
reversing the first operation, $\frac{8}{15} \times \$\frac{15}{14} = \$\frac{4}{7}$, *Ans.*

Ex. 36. $7\frac{1}{2}$ is a quotient and $1\frac{2}{7}$ a divisor, and $\frac{15}{2} \times \frac{9}{7} = \frac{135}{14}$, the dividend; $\frac{135}{14}$ is a product and $5\frac{2}{5}$ a multiplier, and $\frac{135}{14} \div \frac{27}{5} = \frac{25}{14}$, the multiplicand; $\frac{25}{14}$ is a remainder and $\frac{3}{8}$ a subtrahend, and $\frac{25}{14} + \frac{3}{8} = \frac{121}{56}$, the minuend; $\frac{121}{56}$ is the sum of two numbers and $1\frac{3}{4}$ is one of them, and $\frac{121}{56}-\frac{7}{4}=\frac{23}{56}$, the required number, *Ans.*

Ex. 37. $\frac{2}{3}\times\frac{4}{5}\times\frac{7}{2}\times\frac{7}{8}\times\frac{9}{2}=\frac{147}{20}$; $\frac{147}{20}+\frac{25}{6}=\frac{691}{60}$;
$\frac{3}{7}\times\frac{691}{60}=\frac{691}{140}$; $\frac{691}{60}-\frac{691}{140}=\frac{691}{105}=6\frac{61}{105}$, *Ans.*

DECIMAL FRACTIONS.

NOTATION AND NUMERATION

(**210**, page 120.)

Ex 4.	*Ans.*	.496	Ex. 5.	*Ans.*	.0325
Ex 6.	*Ans.*	.000001	Ex. 7.	*Ans.*	.0000074
Ex. 8.	*Ans.*	.437549	Ex. 9.	*Ans.*	.3040010
Ex. 10.	*Ans.*	.00000024	Ex. 11.	*Ans.*	.08645
Ex. 12.	*Ans.*	.495705048	Ex. 13.	*Ans.*	.0000099009
Ex. 14	*Ans.*	.04735901	Ex. 15.	*Ans.*	.000000000001
Ex. 16	*Ans.*	.1001001001001			
Ex. 17	*Ans.*	.000841563436			
Ex. 18.	*Ans.*	.000000000000000009			
Ex. 19.	*Ans*	.3	Ex. 25.	*Ans.*	46.4
Ex. 20.	*Ans.*	.105	Ex. 26.	*Ans.*	205.65
Ex. 21.	*Ans.*	.0011	Ex. 27.	*Ans.*	60.00036
Ex. 22.	*Ans.*	.00085	Ex. 28.	*Ans.*	705.000000005
Ex. 23.	*Ans.*	.100004	Ex. 29.	*Ans.*	300.10001001
Ex. 24.	*Ans.*	.0000704	Ex. 30.	*Ans.*	52.000000000005

Ex. 31. Twenty-four hundredths.
Ex. 32. Seventy-five thousandths.
Ex. 33. Five hundred three thousandths.
Ex. 34. Seven hundred twenty-five hundred-thousandths.
Ex. 35. Forty million four hundred-millionths.

Ex. 36 Two hundred fifty-six ten-millionths.

Ex. 37. Ten thousand seventy-five ten-millionths.

Ex. 38. Eight, and twenty-five hundredths.

Ex. 39. Seventy-five, and three hundred sixty-eight thousandths.

Ex. 40. Forty-two, and six hundred thirty-seven ten-thousandths.

Ex. 41. Eight, and seventy-four ten thousandths.

Ex 42. Thirty, and four thousand seventy-five ten-thousandths.

Ex. 43. Twenty-six, and five hundred-thousandths.

Ex. 44. One hundred, and one hundred-millionth.

REDUCTION.

(**211**, page 121.)

Ex. 1. .1800000
.4560000
.0075000
.0000010
.0500000
.3789000
.5943786
.0010000

Ex. 2. .012000000000
.000185000000
.000000936000
.000000000007

Ex. 3. 57.300000
900.000000
4.755500
100.000001

(**212**, page 122.)

Ex. 1. $\frac{75}{100}=\frac{3}{4}$, *Ans.*

Ex. 2. $\frac{625}{1000}=\frac{5}{8}$, *Ans.*

Ex. 3. $\frac{12}{100}=\frac{3}{25}$, *Ans.*

Ex. 4. $\frac{68}{100}=\frac{17}{25}$, *Ans.*

Ex 5. $\frac{5625}{10000}=\frac{9}{16}$, *Ans.* Ex. 6. $\frac{24}{1000}=\frac{3}{125}$, *Ans*

Ex. 7. $\frac{32}{1000000}=\frac{1}{31250}$, *Ans.*

Ex. 8 $\frac{2624}{1000000}=\frac{41}{15625}$, *Ans.*

Ex. 10. $\dfrac{57\frac{1}{7}}{100}=\frac{400}{700}=\frac{4}{7}$, *Ans.*

Ex. 11. $\dfrac{66\frac{2}{3}}{100}=\frac{200}{300}=\frac{2}{3}$, *Ans.*

Ex. 12. $\dfrac{444\frac{4}{9}}{1000}=\frac{4000}{9000}=\frac{4}{9}$, *Ans.*

Ex. 13. $\dfrac{24\frac{2}{3}}{1000}=\frac{74}{3000}=\frac{37}{1500}$, *Ans.*

Ex. 14. $\dfrac{984\frac{3}{8}}{1000}=\frac{7875}{8000}=\frac{63}{64}$, *Ans.*

Ex. 15. $7\frac{4}{10}=7\frac{2}{5}$, *Ans.*

Ex. 16. $24\frac{74}{100}=24\frac{37}{50}$, *Ans.* Ex. 17. $\frac{21875}{10000}=\frac{35}{16}$, *Ans.*

Ex 18. $\frac{164}{100}=\frac{41}{25}$, *Ans.* Ex. 19. $\frac{7496}{1000}=\frac{937}{125}$, *Ans*

(**214,** page 123.)

Ex. 3. *Ans.* .875 Ex. 4. *Ans.* .56

Ex. 5. *Ans.* .8125 Ex. 9. *Ans.* .00179687

Ex. 11 *Ans.* .60625 Ex. 15. *Ans.* 32.714286--

Ex. 16 *Ans.* .245 Ex. 17. *Ans* 5.783125

Ex. 20. *Ans.* .30007

ADDITION.

(**216**, page 125.)

Ex. 1. .375
.24
.536
.78567
.4637
.57439
2.97476, *Ans.*

Ex. 2. 5.3756
85.473
9.2
46.37859
45.248377
191.675567, *Ans.*

Ex. 3. .5
.37
.489
.6372
.47856
.02524
2.50000=2.5. *Ans.*

Ex. 4. .4675
.325125
.1616
.2754375
1.2296625, *Ans*

Ex. 5. 4.65
7.322
5.3784125
2.6487875
19.9992000, *Ans.*

Ex. 6. 4.3785
2.66666+
5.42857+
12.4872
24.9609+, *Ans.*

Ex. 7. .137
.435
.836
.937
.496
2.841, *Ans.*

Ex. 8. .0102
.13426
.000567
.000008
.24007
.3851, *Ans*

Ex. 9.
34.72
48.44
152.17
95.36
56.18

Ans 386.87 rods.

Ex. 10.
$\frac{24}{97}$=.24743+
$\frac{75}{436}$=.17224+
$\frac{37}{150}$=.24666+
$\frac{1}{1728}$=.00058—

.66691± =
.6669+, *Ans*

Ex 11.
$16\frac{6}{19}$=16.316—
$15\frac{2}{17}$=15.118—
$18\frac{15}{31}$=18.484—
$14\frac{7}{45}$=14.155+

64.07+, *Ans.*

Ex. 12.
.45
.0275
.009125
.000304

.486929, *Ans*

Ex. 13. 1 dec. unit of the first order=.1
$\frac{1}{2}$ " " " second " =.005
$\frac{1}{3}$ " " " third " =.00033333333+
$\frac{1}{4}$ " " " fourth " =.000025
$\frac{1}{5}$ " " " fifth " =.000002
$\frac{1}{6}$ " " " sixth " =.00000016666+
$\frac{1}{7}$ " " " seventh " =.00000001428+

Ans. .1053605143-

SUBTRACTION.

(**217**, page 126)

Ex. 4.
37.456
24.367

13.089, *Ans.*

Ex. 5.
1.0066
.15

.8566, *Ans*

Ex 6
1000.000
.001

999.999, *Ans.*

Ex. 7.
36.75
22.48

14.27, *Ans*

(**125, 126**)

Ex. 8.
.56875
.55992
.00883, *Ans.*

Ex. 9.
7.33333+
5.5625
1.7708+, *Ans*

Ex. 10.
$\frac{991}{997}$=.9939819+
$\frac{719}{761}$=.9448094+
.0491725±, *Ans.*

Ex. 11.
1.
.000000000001
Ans. .999999999999

Ex. 12.
57436.00
536.74
1756.19
3678.47
9572.15
7536.59
4785.94
Ans. 29569.92 acres.

Ex 13.
$\frac{54321}{12345}$=4.400243+
$\frac{12345}{54321}$= .227260+
4.17298+, *Ans*

MULTIPLICATION.

(**219**, page 127.)

Ex. 2.	*Ans* .10464	Ex. 5.	*Ans.* 9.3654
Ex. 8.	*Ans.* 104.976	Ex. 9.	*Ans.* 17.019
Ex. 11.	*Ans.* 360.	Ex. 12.	*Ans.* 1.
Ex 13.	*Ans.* 57600.	Ex. 15.	*Ans.* 15.15
Ex 18.	*Ans.* 4.626	Ex. 20.	*Ans.* 168.48×27.37=4612.14 pounds, *Ans*

Ex. 21. 2.8×36=100.8 bushels of oats for 36 bushels of corn; 100.8+48=148.8, *Ans.*

CONTRACTED MULTIPLICATION.

(**222**, page 131.)

Ex. 2
36.275
763.4
1451
109
22
2
158.4±, *Ans.*

Ex. 3.
.24367
57.63
731
146
17
1
8.95±, *Ans.*

Ex. 4.
4256.785
46500.
21284
2554
170
24.008±, *Ans.*

Ex. 5.
357.84327
608700.1
357 8433
2 5049
2863
21
360.6366±, *Ans.*

Ex. 6
400.756
85763.1
400 76
120 23
24 05
2 80
20
3
548.07±, *Ans.*

Ex. 7.
432.5672
666660.1
432 567
25 954
2 595
260
26
3
461.405±, *Ans.*

Ex. 8 48.4367
+31531.2 $=2\frac{5}{37}$
96873
4844
1453
242
5
1
103.418±, *Ans.*

Ex. 9. 7.04424 $=7\frac{5}{113}$
+94658.3 =3[illegible]
21133
5635
352
42
3
1
27.166±, *Ans.*

Ex. 10. 142.8373+
53025.2
28567
7142
286
4
1
Ans. 360.00± degrees.

Ex. 11. 35.8756
8833.8
28700
1076
108
29
3
Ans. 299.16± pounds.

Ex. 12. 478.7862
65390.1
47879
4308
144
24
3
Ans. 523.58± yards.

Ex. 13. 6377397.6
643126000.
382644
12755
638
191
25
4
Equatorial radius, 3962.57± miles.

$$
\begin{array}{r}
6356078.96 \\
643126000. \\
\hline
381365 \\
12712 \\
636 \\
191 \\
25 \\
4 \\
\hline
\end{array}
$$

Polar radius, 3949.33± miles.

DIVISION.

(**224**, page 133.)

Ex. 1. *Ans.* .2 Ex. 7. *Ans.* .8666+

Ex. 9. *Ans.* .00666+ Ex. 10. *Ans.* .0075

Ex. 11. *Ans.* .0000436 Ex. 12. *Ans.* .8333+

Ex. 13. *Ans.* .6455 Ex. 14. *Ans.* 6.165

Ex. 15. 16.2÷2.7=6, *Ans.*

Ex. 16. 674÷36.34=18.547+ days, *Ans.*

Ex. 17. 5280÷14.25=370.5+, *Ans.*

CONTRACTED DIVISION.

(**226**, page 135.)

Contracted decimal division is most readily performed by the method of inverting the quotient, described in Note 2, page 135, of the Arithmetic.

Ex 1. 4.3267)27.3782		Ex. 2. 1.003675)487.24	
823.6	25960	64.584	401 47
	1418		8577
Ans. 6.328±	1298	*Ans.* 485.46±	8029
	120		548
	87		502
	33		46
	34		40
			6

Ex. 3. 75.430)8.47326		Ex. 4. .075637).8487564	
33211.	75430	122.11	75637
	9302		9238
Ans. .11233	7543	*Ans.* 11.221±	7564
	1759		1674
	1509		1513
	250		161
	226		151
	24		10
	23		8

In the following operations, Abbreviated Long Division is combined with decimal contraction, (see Arithmetic, **112**, page 50).

Ex. 5. 1.436666+)478.325		Ex. 6. 756.3452)8972.436	
249.233	47 325	9268.11	1408 98
	4 225		652 63
Ans 332.942±	1 352	*Ans.* 11.8629±	47 56
	59		2 18
	2		67

(135, 136)

```
Ex. 7   1.007633)1.000000     Ex. 8.  44.736546).95372843
        5 24299.   93130              77813120.  589975
                    2443                         142610
Ans. .992425±        428      Ans. .02181877±      8400
                      25                           3926
                       5                            347
                                                     34
Ex. 9.  5737)4273.0                                   3
        8447.  257 1
               27 6
Ans. .7448±     4 7
                  1
```

CIRCULATING DECIMALS.

REDUCTION.

(**238**, page 139.)

Ex. 1. $\dot{4}\dot{5}=\frac{45}{99}=\frac{5}{11}$, *Ans.* Ex. 2. $.\dot{6}\dot{6}=\frac{66}{99}=\frac{2}{3}$, *Ans.*

Ex. 3. $\dot{2}7\dot{9}=\frac{279}{999}=\frac{31}{111}$, *Ans.*

Ex. 4. $\dot{4}2\dot{3}=\frac{423}{999}=\frac{47}{111}$, *Ans.*

Ex. 5. $\dot{9}2307\dot{6}=\frac{923076}{999999}=\frac{12}{13}$, *Ans.*

Ex. 6. $.\dot{9}512\dot{1}=\frac{95121}{99999}=\frac{39}{41}$, *Ans.*

Ex. 7. $4.\dot{7}\dot{2}=4\frac{72}{99}=4\frac{8}{11}$, *Ans.*

Ex. 8. $2.\dot{2}9\dot{7}=2\frac{297}{999}=2\frac{11}{37}=\frac{85}{37}$, *Ans.*

Ex. 9. $\dot{2}.9\dot{7}=2.\dot{9}7\dot{2}=2\frac{972}{999}=2\frac{36}{37}=\frac{110}{37}$, *Ans.*

Ex. 10. $\dot{1}5.\dot{0}=15.\dot{0}1\dot{5}=15\frac{15}{999}=15\frac{5}{333}$, *Ans.*

(**239**, page 141.)

Ex. 1. $.5\dot{7}=\frac{57-5}{90}=\frac{52}{90}=\frac{26}{45}$, *Ans.*

Ex. 2. $.04\dot{8}=\frac{48-4}{900}=\frac{44}{900}=\frac{11}{225}$, *Ans.*

Ex. 3. $.64\dot{7}\dot{2}=\frac{6472-64}{9900}=\frac{6408}{9900}=\frac{178}{275}$, *Ans.*

Ex. 4. $.65\dot{9}\dot{0}=\frac{6590-65}{9900}=\frac{6525}{9900}=\frac{29}{44}$, *Ans.*

Ex. 5. $.04\dot{6}4\dot{8}=\frac{4648-4}{99900}=\frac{4644}{99900}=\frac{43}{925}$, *Ans.*

Ex. 6. $.100\dot{4}=\frac{1004-100}{9000}=\frac{904}{9000}=\frac{113}{1125}$, *Ans.*

Ex. 7. $.9\dot{2}8571\dot{4}=\frac{9285714-9}{9999990}=\frac{9285705}{9999990}=\frac{13}{14}$, *Ans.*

Ex. 8. $5.2\dot{7}=\frac{527-52}{90}=\frac{475}{90}=\frac{95}{18}$, *Ans.*

Ex. 9. $7.01\dot{2}\dot{6}=7\frac{125}{9900}=7\frac{5}{396}$, *Ans.*

Ex. 10 $1.582\dot{3}170\dot{7}=\frac{158231707-1582}{99999000}=\frac{519}{328}$, *Ans.*

Ex 11. $2.0\dot{2}926\dot{8}=\frac{2029268-20}{999990}=\frac{416}{205}$, *Ans.*

(**240**, page 142.)

Ex. 1. $.4\dot{3}=.4\dot{3}33333\dot{3}$
$.\dot{5}\dot{7}=.57\dot{5}7575\dot{7}$
$.4\dot{5}6\dot{7}=.45\dot{6}7567\dot{5}$
$.50\dot{3}\dot{7}=.50\dot{3}7373\dot{7}$

Ex. 2. $.57\dot{8}=.57\dot{8}8\dot{8}$
$.\dot{3}\dot{7}=.37\dot{3}7\dot{3}$
$.248\dot{5}=.248\dot{5}\dot{5}$
$.\dot{0}\dot{4}=.040\dot{4}\dot{0}$

Ex. 3. $\dot{1}.3\dot{4}=1.3\dot{4}1341\dot{3}$
$\dot{4}.5\dot{6}=4.5\dot{6}4564\dot{5}$
$.3\dot{4}\dot{1}=.3\dot{4}141\dot{4}\dot{1}$

Ex. 4. $.\dot{5}67\dot{4}=.5\dot{6}7456745674\dot{5}$
$.3\dot{4}=.3\dot{4}4444444444\dot{4}$
$.\dot{2}4\dot{7}=.2\dot{4}7247247247\dot{2}$
$.\dot{6}\dot{7}=.6\dot{7}6767676767\dot{6}$

Ex. 5. $\dot{1}.2\dot{4}=1.24\dot{1}2412412412412\dot{4}$
$.0\dot{5}7\dot{8}=.05\dot{7}8578578578578\dot{5}$
$.\dot{4}=.44\dot{4}44444444444444\dot{4}$
$.47\dot{3}214\dot{7}=.47\dot{3}2147321473214\dot{7}$

Ex. 6. $\dot{7}=.777\dot{7}77777777\dot{7}$
$.456\dot{7}=.456\dot{7}77777777\dot{7}$
$.\dot{2}\dot{4}=.242\dot{4}24242424\dot{2}$
$.3\dot{4}678\dot{9}=.346\dot{7}89467894\dot{6}$

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Ex. 7
$.\dot{8} = .\dot{8}888888888888888888\dot{8}$
$.\dot{3}\dot{6} = .\dot{3}636363636363636363\dot{6}$
$.\dot{4}85\dot{7} = .\dot{4}857485748574857485\dot{7}$
$.\dot{3}456\dot{7} = .\dot{3}456734567345673456\dot{7}$
$.\dot{2}78467894\dot{3} = .\dot{2}784678943278467894\dot{3}$

ADDITION AND SUBTRACTION.

(**242**, page 143.)

Ex. 1.
$2.4\dot{4}44444\dot{4}$
$.3\dot{2}3232\dot{3}$
$.5\dot{6}7567\dot{5}$
$7.0\dot{5}6565\dot{6}$
$4.3\dot{7}7777\dot{7}$
$14.7\dot{6}9587\dot{7}$, *Ans.*

Ex. 2.
$.4\dot{7}87878787878\dot{8}$
$.3\dot{2}1321321321\dot{3}$
$.7\dot{8}5648564856\dot{4}$
$.8\dot{2}2222222222\dot{2}$
$.5\dot{5}5555555555\dot{5}$
$.4\dot{3}2643264326\dot{4}$
$2.8\dot{9}6178807069\dot{8}$, *Ans*

Ex 3.
$.7\dot{8}5485\dot{4}$
$.5\dot{9}5959\dot{5}$
$.1\dot{8}9525\dot{8}$, *Ans.*

Ex. 4.
$57.\dot{0}58\dot{7}$
$27.\dot{3}13\dot{1}$
$29.\dot{7}45\dot{5}$, *Ans.*

Ex. 5.
$.\dot{5}\dot{5}$
$.\dot{3}\dot{2}$
$.\dot{1}\dot{2}$
$.\dot{9}\dot{9}=1$, *Ans*

Ex. 6.
$.48\dot{8}\dot{7}$
$.86\dot{3}\dot{3}$
$.21\dot{1}\dot{1}$
$.35\dot{5}\dot{4}$
$1.86\dot{8}\dot{6}=1.\dot{8}\dot{6}$, *Ans.*

Ex. 7. $3.6\dot{5}3753\dot{7}$
$3.1\dot{3}5135\dot{1}$
$2.5\dot{6}4646\dot{4}$
$.5\dot{3}5353\dot{5}$
$9.8\dot{8}8888\dot{8}=9.\dot{8}$, *Ans.*

Ex. 8. $.43\dot{2}4\dot{3}$
$.25\dot{0}0\dot{0}$
$.18\dot{2}4\dot{3}$, *Ans.*

Ex 9. $7.24\dot{5}7\dot{4}$
$2.63\dot{4}6\dot{3}$
$4.61\dot{1}1\dot{1}=4.6\dot{1}$, *Ans.*

Ex. 10. $.99\dot{0}0\dot{0}$
$.43\dot{3}4\dot{3}$
Ans. $.55\dot{6}5\dot{6}$

Ex. 11. $4.\dot{6}3863\dot{8}$
$8.\dot{3}1831\dot{8}$
$.\dot{0}1601\dot{6}$
$.\dot{5}4545\dot{4}$
$.\dot{4}5454\dot{5}$
$13.\dot{9}7297\dot{2}=13.\dot{9}7\dot{2}=13\frac{972}{999}=13\frac{36}{37}$, *Ans.*

Ex. 12. $.\dot{4}\dot{4}$
$.\dot{2}\dot{3}$
$.\dot{2}\dot{1}=\frac{21}{99}=\frac{7}{33}$, *Ans.*

MULTIPLICATION AND DIVISION.

(**244**, page 144.)

Ex. 1 $3.4=\frac{34}{10}$; $\dot{7}\dot{2}=\frac{72}{99}$; $\frac{34}{10}\times\frac{72}{99}=\frac{136}{55}=2.4\dot{7}\dot{2}$, *Ans.*

Ex. 2 $.0\dot{4}3\dot{2}=\frac{432}{9990}$; $\frac{432}{9990}\times\frac{18}{1}=\frac{144}{185}=.7\dot{7}8\dot{3}$, *Ans.*

Ex. 3. $.\dot{1}5\dot{4}=\frac{154}{999}$; $.\dot{2}=\frac{2}{9}$; $\frac{154}{999}\times\frac{9}{2}=\frac{77}{111}=.\dot{6}9\dot{3}$, *Ans.*

Ex. 4. $4.\dot{5}72\dot{4}=\frac{45724}{9999}$; $.\dot{7}=\frac{7}{9}$;
$\frac{45724}{9999}\times\frac{9}{7}=\frac{6532}{1111}=5.\dot{8}79\dot{3}$, *Ans.*

Ex. 5. $4.3\dot{7}=\frac{394}{90}$; $.27=\frac{27}{100}$; $\frac{394}{90}\times\frac{27}{100}=1.182$, *Ans.*

Ex. 6. $56.\dot{6}=\frac{510}{9}$; $\frac{510}{9}\times\frac{1}{137}=\frac{170}{411}=.\dot{4}136253\dot{0}$, *Ans.*

Ex. 7. $\frac{428571}{999999}\times\frac{99}{54}=\frac{11}{14}=.7\dot{8}5714\dot{2}$, *Ans.*

Ex 8. $\frac{714285}{999999}\times\frac{27}{99}=\frac{21645}{111111}=.\dot{1}9480\dot{5}$, *Ans.*

Ex 9. $3.45\dot{6}=\frac{3111}{900}$; $.42\dot{5}=\frac{383}{900}$;
$\frac{3111}{900}\times\frac{383}{900}=\frac{397171}{270000}=1.471\dot{0}3\dot{7}$, *Ans.*

Ex. 10. $9.\dot{1}704\dot{5}=\frac{917045}{99999}$; $3.\dot{3}\dot{6}=\frac{333}{99}$;
$\frac{917045}{99999}\times\frac{99}{333}=\frac{10087495}{3699963}=2.\dot{7}263\dot{7}$, *Ans.*

Ex. 11. $\frac{24}{99}\times\frac{57}{99}=\frac{152}{1089}=.\dot{1}39577594123048668503\dot{2}$, *Ans*

UNITED STATES MONEY.

NOTATION AND NUMERATION.

(**250**, page 146.)

Ex. 2. *Ans.* $4.07 Ex. 3. *Ans.* $10.04
Ex. 4. *Ans.* $16.004 Ex. 5. *Ans.* $.31¼, or $.315
Ex. 7. *Ans.* $1000.011 Ex. 8. *Ans.* $32.584
Ex. 9. *Ans.* $.06¼, or $.0625

Ex. 10. Twenty-one dollars eighteen cents; one hundred sixty-four dollars five cents; seven dollars ninety cents; ten dollars one cent; two hundred one dollars twenty cents one mill; five dollars thirty-seven and one-half cents; eighty-one and one-fourth cents; fifteen dollars eight and one-third cents; ninety-six dollars five mills.

OPERATIONS IN UNITED STATES MONEY.

(**252**, page 147.)

Ex 1.
$3475.50
810.20
1287.375
207.125
$5280.20, *Ans.*

Ex. 2.
$4.62½
1.75
.87½
1.00
.62½
$8.87½, *Ans*

Ex. 3. $390.375
$150.000
175.84
62.50
$ 2.035, *Ans.*

Ex. 4. $3800
190.87½
$3990.87½, *Ans.*

Ex. 5. $50.000
$10.75
5.50
2.375
.875
.625
$29.875, *Ans.*

Ex. 6. $ .375×150=$56.25
3.875×4 = 15.50
$71.75
$ .06¼×84= 5.25
.62½×25= 15.62½
5.87½×2 = 11.75
$39.12½, *Ans.*

Ex. 7. $31.25×126.25=$3945.31¼
33.75×138.25= 4665.93¾
$8611.25
$8611.25—$6726=$1885.25, *Ans.*

Ex. 8. $.80 ×28½×40 =$ 912.
.11½×29 ×300= 1000.50
3.87½×36¼×20 = 2809.37½
.06¼×30½×112= 213.50
$11000 —$4935.37½=$6064.62½, *Ans.*

Ex. 9. $2189.25÷139=$15.75, *Ans.*

Ex. 10. $44.748÷396×$.113, *Ans.*

Ex. 11. $4.50×10.75=$48.375;
$48.375÷7.74=$6.25, *Ans.*

Ex. 12. $4885.80÷$287.40=17, *Ans.*

Ex. 13. $3.75+$2.875=$6.625, cost of a calf and a sheep
$265÷$6.625=40, *Ans.*

Ex. 14.

$$\begin{array}{r|l} & 128 \\ 9632 & 1730.75 \\ \hline & 23, \textit{Ans.} \end{array}$$

Ex. 15.

$$\begin{array}{r|l} & 125 \\ 41.25 & 112.20 \\ 2.5 & \\ \hline & 136, \textit{Ans.} \end{array}$$

Ex. 16. $2475.36—$1936.40=$538.96, the amount his money has *diminished* since the beginning of the month, which, by the conditions, must be $\frac{5}{5}$—$\frac{3}{5}$=$\frac{2}{5}$ of what he had at the beginning of the month. Hence, $538.96÷$\frac{2}{5}$=$1347.40, *Ans.*

Ex. 17. $3200—$138×12=$1544, saves yearly;
$1544×8=$12352, *Ans.*

Ex. 18. $45.75×120=$5490; $5490—$1026=$4464;
$4464÷120=$37.20, *Ans.*

Ex. 19. $6.25×425=$2656.25;
$3088.25—$2656.25=$432; $432÷$4.50=96;
425+96=521 barrels, *Ans.*

Ex. 20. $6315.12÷36=$175.42, wages for 1 engineer;
$21927.50÷$175.42=125, *Ans.*

Ex. 21. $2538+$750—$1378.56=$1909.44, *Ans.*

Ex. 22. $1.875×22=$41.25; $41.25—$25.75=$15.50;
$1116÷$15.50=72 months; 72÷12=6 years, *Ans.*

Ex. 23. ($453.75÷27.5)+$3.625=$20.125, *Ans.*

Ex. 24. $.95+$1.37+$.73=$3.05, cost of 1 bushel of each kind; $70.15÷$3.05=23 bushels of each kind; 23×3=69 bushels, *Ans.*

Ex. 25. 375.5÷2=187.75; $1032.625÷187.75=$5.50 profit per acre; $22.25+$5 50=$27.75, *Ans*

Ex. 26. $\$11.37\frac{1}{2}=\$\frac{91}{8}$

$$\begin{array}{r|l} 8 & \$91 \\ 7 & 2 \\ 8 & 161 \\ \hline 32 & 2093 \end{array}$$

$65.40⅝, *Ans.*

Ex. 27. $\$46.75=\$\frac{187}{4}$

$$\begin{array}{r|r} 4 & 3 \\ 51 & 8 \\ 4 & 187 \\ \hline 2 & 11 \end{array}$$

5.5 hundred pounds

Ex 28. $62.50—($8.25×12½)=$21.875;
$21.875÷$.125=175 pounds, *Ans*

Ex. 29. $10.04÷16=$.6275; $17.50÷20=$.875;
$.875—$.6275=$.2475;
$.2475×320=$79.20, *Ans.*

PROBLEMS

INVOLVING THE RELATION OF PRICE, COST, AND QUANTITY

(**257**, page 151.)

Ex. 1. $1.32×187=$246.84, *Ans.*

Ex. 2. $$\frac{3}{16}$×70½×5=$66.09⅜, *Ans.*

Ex. 3. $501.875÷365=$1.375, *Ans.*

Ex. 4. $18.48÷$.105=176, *Ans.*

Ex. 5. $17.75÷2=$8.875;
$8.875×.1625×140=$201.906¼, *Ans.*

Ex. 6. $16.50×32.40=$534.60, *Ans.*

Ex. 7. $66.44×842.75=$55992.31, *Ans*

Ex. 8. $10660.125÷325.5=$32.75, *Ans.*

Ex. 9. $1.94×8.40=$16.296; $12.50×1.262=$15.775
$16.296+$15.775=$32.071, *Ans.*

Ex. 10 $37.6875÷$1 50=25.125=25⅛ bushels, *Ans.*

Ex. 11. $\$3.875 \div 2 = \$1.9375$;
$\$1.9375 \times 2.172 = \$4.208\frac{1}{4}$, *Ans.*

Ex. 12. $\$.37\frac{1}{2} = \$\frac{3}{8}$; $\$\frac{3}{8} \times \frac{5}{8} \times \frac{456}{1} = \$106.87\frac{1}{2}$, *Ans.*

Ex. 13. $\$81.25 \div 32.5 = \$2.50$, *Ans.*

Ex. 14. $\$9.375 \times 24.240 = \$227.25$, *Ans.*

Ex. 15. $\$4234\frac{3}{8} \div \$5\frac{5}{8} = 752\frac{7}{9}$, *Ans.*

Ex. 16. $\$20.25 \times .972 = \$19.683$
$2.875 \times 15.75 = 45.281\frac{1}{4}$
$7.50 \times 8.756 = 65.670$
$\$130.634\frac{1}{4}$, *Ans.*

Ex. 17. $\$4.625 \times 10.46 = \$48.37\frac{3}{4}$, *Ans.*

Ex. 18. $\$4.70 \div 2 = \$2.35$; $\$5.25 \div 2 = \$2.62\frac{1}{2}$;
$\$2.35 \times 5.840 = \$13.724$
$2.62\frac{1}{2} \times 4.376 = 11.487$
$\$25.211$, *Ans.*

Ex. 19. $\$2 \div \$2.50 = \frac{4}{5}$ yards, *Ans.*

Ex. 20. $\$5.75 \times 37 = \$212.75$, *Ans.*

Ex. 21. $\$.96 \times 38.40 = \$36.864$, *Ans.*

Ex. 22. $\$2.875 \times 27\frac{2}{3} \times 9 = \$715.87\frac{1}{2}$, *Ans.*

Ex. 23. $\$80.745 \div \$.42 = 192\frac{1}{4}$ pounds, *Ans.*

Ex. 24. $\$15.50 \times .327 = \$\ 5.0685$
$1.625 \times 6.72 = 10.92$
$4.25 \times 1.108 = 4.709$
$\$20.6975$, *Ans.*

Ex. 25. $\$15\frac{3}{4} \div \$\frac{7}{8} = 18$, *Ans.*

Ex. 26. $\$5 \times 18.962 = \$94.81$, *Ans.*

Ex. 27. $\$27.90 \div 15.5 = \$1.80$, *Ans.*

Ex. 28. $\$125.38 \times 27.86 = \$3493.0868$, *Ans.*

Ex. 29. $\$13.125 \div .7 = \$18.75$, *Ans.*

Ex. 30. $12.75÷2=$6.375; $15.50÷2=$7.75;
$6.375×.720 =$4.59
$7.75 ×.912 = 7.068
$11.658, *Ans.*

LEDGER ACCOUNTS.

(**258**, page 153)

Ex. 1. *Ans.* $3434.80
Ex. 2. *Ans.* $7222.55
Ex. 3. *Ans.* $73785.18
Ex. 4. *Ans.* $750026.82

ACCOUNTS AND BILLS.

(**267**, page 155.)

Ex. 1.

$2.85 ×10 =$28.50
1.12½×16 = 18 00
.14 ×72 = 10.08
.16½×42 = 6.93
.40 ×12 = 4.80
56 ×24½= 13.72
Ans. $82.03

Ex. 2.

$1.25 ×125=$156.25
1.75 ×275= 481.25
1.12½×180= 202.50
.87½×210= 183.75
.84 ×80 = 67.20
.90 ×95 = 85.50
1.06 ×175= 185.50
30.50 ×8 = 244.00
35.75 ×3 = 107.25
.10½×958= 100.59
.37½×40 = 15.00
Ans. $1828.79

Ex. 3 $27 50 ×40=$1100.00
19.20 ×25 = 480.00
48.10 ×16= 769.60
17.75 ×12= 213.00
26.30 ×20= 526.00
31.85 ×15= 477.75
3.87½×36= 139.50
4.12½×42= 173.25
2.90 ×25= 72.50
$3951.60, *Ans.*

Ex. 4. $6.25 ×150=$937.50
7.16 ×275=1969.00
5.87½×170= 998.75
1.62½×326= 529.75
.82 ×214= 175.48
.91 ×300= 273.00
1.06 ×500= 530.00
$5413.48, *Ans*

	Dr.	*Cr.*
Ex. 5	$64.30 ×24 =$1543.20	$17.60 ×20=$352.00
	10.25 ×15 = 153.75	3.12½×50= 156.25
	7.78 × 7 = 54.46	9.37½×42= 393.75
	8.45 ×25 = 211.25	1000.00
	16.12½×14 = 225.75	3.10 ×75= 232 50
	5.90 ×27 = 159.30	.87½×36= 31.50
	.09½×1840= 174.80	
	$2522.51	$2166.00
		2522.51
		Balance, $356.51

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	Dr.		*Cr.*	
Ex. 6	$\$\ .23\times896=$	\$206.08	$\$2.25\times61=$	\$137.25
	$.09\frac{1}{4}\times872=$	80.66	$.22\times70=$	15.40
	$.11\frac{3}{8}\times481\frac{1}{2}=$	54.77	$.87\frac{1}{2}\times56=$	49.00
	$.13\frac{1}{2}\times509\frac{3}{4}=$	68.82	$.68\frac{3}{4}\times31=$	21.31
	$.16\frac{2}{3}\times81=$	13.50		
	$1.40\times15=$	21.00		
	$.12\frac{1}{2}\times963\frac{3}{8}=$	120.42		
		\$565.25		\$222.96
				565.25
			Note to Bal.,	\$342.29

PROMISCUOUS EXAMPLES.

Ex. 1. $\$4.875\times12\frac{5}{8}=\$61.54+$, *Ans.*

Ex. 2. $\$33.75\div\$.375=90$; $90\div2\frac{1}{2}=36$, *Ans.*

Ex 3. $36\times36=1296$; $\$97.20\div1296=\$.075$, *Ans.*

Ex. 4. $\$5.35\div.625=\$8.56$, *Ans.*

Ex. 5. $.0\frac{1}{3}\ =.033\frac{1}{3}$

$.00\frac{5}{8}=.008\frac{1}{3}$

$.025$, *Ans.* Or, $\frac{1}{30}-\frac{5}{600}=\frac{1}{40}=.025$, *Ans.*

Ex. 6. $814\frac{99}{200}\times26\frac{15}{32}=814.495\times26.46875$

$=21558.66+$, *Ans.*

Ex 7 $\$75\times5=\$375$; $\$68\times12=\$816$; $5+12=17$;

$\$375+\$816+\$118=\$1309$;

$\$1309\div17=\$77$, *Ans.*

Ex. 8. $\$.625\times.8=\$\ 50$, *Ans.*

Ex. 9. $\$\ 87\frac{1}{2}+\$.18\frac{3}{4}+\$.10\frac{1}{4}=\$1.165$;

$\$27.96\div\$1.165=24$, *Ans.*

Ex. 10. $13543.47 \div 365.25 = 37.08$ miles in 1 day;
$37.08 \times \frac{7}{8} = 32.445$ miles, *Ans.*

Ex. 11. $\$5.12\frac{1}{2} \times 100 = \$512.50$ $\$6.50 \times 75 = \$487.50$
$1.06\frac{1}{4} \times 250 = 265.62\frac{1}{2}$ $1.37\frac{1}{2} \times 250 = 343.75$
$221.87\frac{1}{2}$
$\$831.25$
$\$1000.00 - \$831.25 = \$168.75$, to be realised on the remaining 25 barrels of flour; hence $\$168.75 \div 25 = \$6.75$, *Ans.*

Ex. 12. $4580.289 \div 114.45 = 40.02$ bushels from 1 acre;
$120.06 \div 40.02 = 3$ acres, *Ans.*

Ex. 13. $.017226 + \div .030625 = .5625 \pm$, *Ans.*

Ex. 14. $13.5 \div .0225 = 600$, *Ans.*

Ex. 15. $8.5 \div 5 = 1.7$ rods, his daily work;
$59.5 - 8.5 = 51$; $51 \div 1.7 = 30$ days, *Ans.*

Ex. 16. $\$.375 \times 28.5 = \$10.68\frac{3}{4}$; $12520 \div 2000 = 6.26$ tons;
$75 \times 4.53 = 3.39\frac{3}{4}$
$\$14.085 \div 6.26 = \$2.25$, *Ans.*

Ex. 17. $1826 + 1478 + 1921 = 5225$; $\$8.80 \div 2 = \$4.40$;
$\$4.40 \times 5.225 = \$22.99$ $\$.09 \times 31 = \$2.79$
$5.25 \times 2.81 = 14.75\frac{1}{4}$ $4.50 \times 6\frac{1}{2} = 29.25$
$\$37.74\frac{1}{4} - \$32.04 = \$5.70\frac{1}{4}$, *Ans.*

Ex. 18. $\$122.50 \div 35 = \$3.50$; $\$3.50 \times 29 = \$101.50$, *Ans.*

Ex. 19. $\$.56\frac{1}{4} \times 1200 = \$675$
168.675
$\$843.675$
$\$.60 \times 375.5 = 225.30$ $1200 - 375.5 = 824.5$;
$\$618.375 \div 824.5 = \$.75$, *Ans.*

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Ex. 20.
$$\begin{array}{r|l} & \$2.856 \\ 1680 & 2000 \\ \hline & \$3.40,\ \textit{Ans.} \end{array}$$

Ex. 21.
$$\begin{array}{r|l} 8 & \$127 \\ .125 & 25.42 \\ \hline & \$3228.34,\ \textit{Ans.} \end{array}$$

Ex 22. $(\$100\times150)-\$3900=\$11100$, cost of whole;
$\$11100\div150=\$74$, cost per acre;
$\$11100-\$2250=\$8850$, sold for;
$\$8850\div150=\$59$, sold for, per acre.

Ex. 23. $\$14.375\times212.5=\$3054.68\frac{3}{4}$, cost;
$1.75\times2125=\$3718.75$, avails;
$\$664.06\frac{1}{4}$, *Ans.*

Ex. 24. $\$545\div10=\$54.50$, cost of 1 acre;
$\$17712.50\div\$54.50=325$, *Ans.*

Ex. 25. $224.56\times7\times\frac{1}{2}\times\frac{1}{4}=196.49$, *Ans.*

Ex. 26. $\$169.8125-\$39.1875=\$130.625$;
$\$130.625\div104.5=\$1.25$, *Ans.*

Ex. 27. $\$6.975\div.93=\$7.50$, *Ans.*

Ex. 28. $\$4000\times.375\times.12=\$180$, *Ans.*

Ex. 29. $$\left(\frac{1\frac{3}{4}}{4\frac{1}{2}}\div\frac{2\frac{1}{3}}{2\frac{1}{4}}\right)\times\frac{4}{5}\times\frac{1}{2}=\frac{7}{4}\times\frac{2}{9}\times\frac{9}{4}\times\frac{3}{7}\times\frac{4}{5}\times\frac{1}{2}$$
$$=\frac{3}{20}=.15,\ \textit{Ans.}$$

Ex. 30. $\$.33\frac{1}{3}\times375=\$125$; $\$125\div7.5=\$16.66\frac{2}{3}$, *Ans.*

Ex. 31 $1+.84=1.84$ times the sum invested;
$1.84\times2=3.68$ times the sum invested, *Ans.*

Ex. 32. $\frac{3}{10}=.3$; $\frac{3}{5}=.6$; $1-(.3+.6)=.1$. Now, if he purchases .3 of a bushel of barley, .6 of a bushel of wheat, and .1 of a bushel of oats, he will have 1 bushel of grain, worth

$$\begin{array}{rr} \$\ .625\times.3= & \$\ .1875 \\ 1.875\times.6= & 1.125 \\ .375\times1= & .0375 \\ \hline & \$1.35 \end{array}$$

(159, 160)

And for \$54, he can purchase as many bushels as \$1.35 is contained times in \$54. Therefore,

$\$54 \div \$1.35 = 40$, *Ans.*

Ex. 33. $19\frac{1}{3} \times 27 = 522$ yards;

$$\begin{array}{r} \$4.31\frac{1}{4} \times 522 = \$2251.12\frac{1}{2} \\ 881.87\frac{1}{2} \\ 9.62\frac{1}{2} \\ \hline \$2642.62\frac{1}{2} \div 522 = \$5.06\frac{1}{4}, \text{ Ans.} \end{array}$$

Ex. 34.

$$\begin{array}{rr} \$1.18\frac{3}{4} & 1356 \\ 1.12\frac{1}{2} & 870 \\ \hline \end{array} \qquad \begin{array}{rr} \$.41 & 736 \\ .31 & 528 \\ \hline \end{array}$$

$\$\,.06\frac{1}{4} \times 486 = \$30.37\frac{1}{2}$; $\$.10 \times 208 = \$20.80$;

$\$30.37\frac{1}{2} + \$20.80 + \$13.62\frac{1}{2} = \$64.80$, entire loss;

$\$235.87\frac{1}{2} - \$64.80 = \$171.07\frac{1}{2}$, gained, *Ans*

Ex. 35. $\frac{125}{176} + \frac{116}{704} = \frac{7}{8}$; $\frac{7}{8} \div 2 = \frac{7}{16}$, greater;

$\frac{125}{176} - \frac{116}{704} = \frac{6}{11}$; $\frac{6}{11} \div 2 = \frac{3}{11}$, less.

Ex. 36. $1 + \frac{4}{9} = \frac{13}{9}$ times his original capital, end of 1st year;

$\frac{13}{9} \times \frac{4}{5} = \frac{52}{45}$ " " " " " 2d "

$\frac{52}{45} \times 1\frac{3}{8} = \frac{143}{90}$ " " " " " 3d "

$\$28585.70 \div \frac{143}{90} = \$17991$, his original capital;

$\$28585.70 - \$17991 = \$10594.70$, gain, *Ans.*

CONTINUED FRACTIONS.

(**271**, page 162.)

The division may be performed in the same manner as in finding the greatest common divisor. (See **150**, Higher Arithmetic.)

Ex. 2.

		6721
1240	5	6200
1042	2	521
198	2	396
125	1	125
73	1	73
52	1	52
21	2	42
20	2	10
1	10	10

Ans.

$$\cfrac{1}{5+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{10}}}}}}}}}$$

Ex. 3.

		516901
223874	2	447748
207459	3	69153
16415	4	65660
13972	4	3493
2443	1	2443
2100	2	1050
343	3	1029
336	16	21
7	3	21

Ans.

$$\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{4+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{16+\cfrac{1}{3}}}}}}}}}$$

Ex. 4.

		121
29	4	116
25	5	5
4	1	4
4	4	1

Ans. $$\cfrac{1}{4+\cfrac{1}{5+\cfrac{1}{1+\cfrac{1}{4}}}}$$

(**273**, page 163.)

Ex. 1. Terms of continued fraction, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{4}$; approximate values, $\frac{1}{2}$, $\frac{3}{7}$, $\frac{16}{37}$, $\frac{67}{155}$, *Ans.*

Ex. 2. Terms of continued fraction, $\frac{1}{4}$, $\frac{1}{4}$, $\frac{1}{1}$, $\frac{1}{7}$, $\frac{1}{2}$; approximate values, $\frac{1}{4}$, $\frac{4}{17}$, $\frac{5}{21}$, $\frac{39}{164}$, $\frac{83}{349}$, *Ans.*

Ex. 3. Terms of continued fraction, $\frac{1}{7}$, $\frac{1}{5}$, $\frac{1}{4}$; approximate values, $\frac{1}{7}$, $\frac{5}{36}$, $\frac{21}{151}$, *Ans.*

Ex. 4. Terms of continued fraction, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{1}$; approximate values, $\frac{1}{3}$, $\frac{4}{13}$, $\frac{9}{29}$, $\frac{40}{129}$, $\frac{49}{158}$, *Ans.*

Ex. 5. Terms of continued fraction, $\frac{1}{1}$, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$; approximate values, 1, $\frac{2}{3}$, $\frac{9}{13}$, $\frac{29}{42}$, *Ans.*

COMPOUND NUMBERS

REDUCTION DESCENDING.

(**367**, page 194.)

Ex. 2 £133×20+6 s.=2666 s.;
2666 s.×12+8 d.=32000 d.;
32001 d.×4=128000 far., *Ans.*

Ex. 3. 100 mi.×63360=6336000 in., *Ans.*

NOTE.—When the number given for reduction contains but one denomination, the scale of relation may be taken from the table of *Unit Equivalents*, and the answer obtained by a single operation.

Ex. 4. $1\frac{1}{2}$ mi.×4=6 mi., length of fence;
6 mi.×320=1920 rd., *Ans.*

Ex. 5. 8×3×3=72 cu. ft., solid contents of the block;
175 lb.×72=12600 lb.; 12600 lb.÷100=126 cwt.,
126 cwt.÷20=6 T. 6 cwt., *Ans.*

Ex. 6. 1 hhd.=63 gal.; \$.28×63=\$17.64, *Ans.*

Ex. 7. 1548 bu. 1 pk.=6193 pk.; 2 bu. 3. pk.=11 pk.;
6193÷11=563, *Ans.*

Ex. 8. \$3.75×10=\$37.50; 10 bu.=640 pt.;
\$.06$\frac{1}{4}$×640=\$40.00; \$40—\$37.50=\$2.50, *Ans.*

Ex. 9. 90°×60+17′=5417′; 5417′×60+40″
=325060,″ *Ans.*

Ex. 10. The 18th century embraced the time from the commencement of A. D. 1701 to A. D. 1800 inclusive, and 1800 was not leap year; hence, 100 yr.×365 +24 da.=36524 da., *Ans.*

Ex. 11. 1 great-gross=1728 units; \$.06$\frac{1}{4}$×1728=\$108, *Ans.*

Ex. 12. 4 bales 4 bundles 1 ream 10 quires=990 quires;
24÷8=3 vol. per quire; 990×3=2970 vol., *Ans.*

Ex. 13. 18 yr.×365+24 da.=6594 da.;
6594 da.×24=158256 h.;
158256 h.×60=9495360 min., *Ans.*

Ex. 14. 481 sov.×240=115440 d., *Ans.*

Ex. 15. \$7$\frac{3}{8}$=\$7.375; \$7.375×1000=7375 mills, *Ans.*

Ex. 16. 3 P.×130=390 gal.; 390 gal.×4=1560 qt., *Ans.*

Ex 17. 37 ells×5+1 qr.=186 qr.;
186 qr.÷4=46 yd. 2 qr., *Ans.*

Ex. 18. £6 10 s. 10 d.=1570 d.;
$.02$\frac{1}{60}$×1570=$31.66+, *Ans.*

Ex. 19. 6 O.×16+14 f℥=110 f℥;
110 f℥×8+3 fʒ=883 fʒ;
883 fʒ×60+45♏=53025♏, *Ans.*

Ex. 20. 1 T. 1 P. 1 hhd.=7 hhd.;
7 hhd.×52$\frac{1}{2}$=367$\frac{1}{2}$ gal., *Ans.*

Ex. 21. £126 12 s. 6 d.=30390 d.;
30390 d.÷60=506\frac{1}{2}$, *Ans*

Ex. 22. 1 hhd.=504 pt.; 2 qt.+1 qt.+1 pt.=7 pt.;
504÷7=72, *Ans.*

Ex. 23. 2 ft. 9 in.=33 in.; 63360÷33=1920 steps in 1 mile; 1920×95=182400, *Ans.*

Ex. 24. 1\frac{3}{4}$×12=$21, cost; 12 bbl.×126=1512 qt.;
$.06×1512=$90.72; $90.72—$21=$69.72, *Ans.*

Ex. 25. 75 A.×10+4 sq. ch.=754 sq. ch.;
754 sq. ch.×16+18 P.=12082 P.;
12082 P.×625+118 sq. l.=7551368 sq. l., *Ans.*

Ex. 26. 4 in.×16=64 in., *Ans.*

Ex. 27. 150 leagues×3×1.15=517.5 miles, *Ans.*

Ex. 28. (50 A.—14 A.)×160=5760 sq. rd., *Ans*

Ex. 29. 36 lb. 8 oz.=8800 pwt.;
$1.042×8800=$9169.60, *Ans.*

Ex. 30 9 cwt. 42 lb.=942 lb.;
942 lb.×8=7536 lb.; 7536÷48=157, *Ans.*

Ex 31. 1\frac{1}{4}$×12=$15, cost; 12 bbl.×280=3360 lb.;
$.0075×3360=$25.20;
$25.20—$15=$10.20, *Ans.*

(194, 195)

Ex. 32. 1 ℔. 10 ℥ $=$ 22℥ $=$ 10560 gr. $=$ 1056 doses;
$\$2.25\times22=\$49.50$; $\$.12\frac{1}{2}\times1056=\$132$;
$\$132-\$49.50=\$82.50$, *Ans.*

(**368**, page 196.)

Ex. 1. $\frac{1}{300}$ lb.$\times\frac{12}{1}\times\frac{20}{1}=\frac{4}{5}$ pwt., *Ans.*
Ex. 2. $\frac{1}{672}$ hhd.$\times\frac{63}{1}\times\frac{4}{1}\times\frac{2}{1}=\frac{3}{4}$ pt., *Ans.*
Ex. 3. $\frac{1}{2112}$ mi.$\times\frac{8}{1}\times\frac{40}{1}\times\frac{11}{2}=\frac{5}{6}$ yd., *Ans.*
Ex. 4. $\frac{9}{342}$ gal.$\times\frac{4}{1}\times\frac{2}{1}\times\frac{4}{1}=\frac{16}{19}$ gi., *Ans.*
Ex. 5. $\frac{1}{5000}\times\frac{2}{3}\times\frac{3}{4}\times\frac{6}{11}\times\frac{22}{7}$ lb.$\times\frac{16}{1}=\frac{12}{4375}$ oz., *Ans*
Ex. 6. $\$\frac{1}{18000}\times\frac{100}{1}=\$.00\frac{1}{180}$, *Ans.*
Ex. 7. $\frac{1}{45}$ P.$\times\frac{25}{1}=\frac{5}{9}$ l., *Ans.*
Ex. 8. $\frac{1}{35}$ ℈$\times\frac{20}{1}=\frac{4}{7}$ gr., *Ans.*
Ex. 9. $\frac{6}{7}\times\frac{4}{11}$ rd.$\times\frac{11}{2}=\frac{12}{7}$ yd., *Ans.*
Ex. 10. $\frac{5}{18}$ wk.$\times\frac{7}{1}\times\frac{9}{2}=8\frac{3}{4}$ da., *Ans.*
Ex. 11. $\frac{3}{1360}\times\frac{17}{4}\times\frac{2}{19}$ A.$\times\frac{160}{1}=\frac{3}{19}$ sq. rd., *Ans.*

(**369**, page 197.)

Ex. 1. $\frac{9}{10}$ yd.$\times3=2\frac{7}{10}$ ft.; $\frac{7}{10}$ ft.$\times12=8\frac{2}{5}$ in.,
Ans. 2 ft. $8\frac{2}{5}$ in.

Ex. 2. $\frac{4}{5}$ mo.$\times30=24$ da., *Ans.*

Ex. 3. $\frac{607}{640}$ T.$\times20=18\frac{31}{32}$ cwt.; $\frac{31}{32}$ cwt.$\times100=96\frac{7}{8}$ lb.;
$\frac{7}{8}$ lb $\times16=14$ oz.,; *Ans.* 18 cwt. 96 lb. 14 oz

Ex. 4. $\frac{5}{9}$ T.$\times20=11\frac{1}{9}$ cwt.; $\frac{1}{9}$ cwt $\times4=\frac{4}{9}$ qr.;
$\frac{4}{9}$ qr.$\times28=12\frac{4}{9}$ lb.; $\frac{4}{9}$ lb.$\times16=7\frac{1}{9}$ oz.;
Ans. 11 cwt. 12 lb. $7\frac{1}{9}$ oz.

Ex. 5. $\frac{3}{8}\times\frac{5}{2}$ ℔.$\times12=11\frac{1}{4}$ ℥; $\frac{1}{4}$ ℥$\times8=2$ ʒ;
Ans. 11 ℥ 2 ʒ

Ex. 6. $\frac{7}{13}$ A. × 160 = $86\frac{1}{80}$ P.;
$\frac{1}{80}$ P. × $30\frac{1}{4}$ × 9 = $3\frac{129}{320}$ sq. ft.;
$\frac{129}{320}$ sq. ft. × 144 = $58\frac{1}{20}$ sq. in.;
Ans. 86 P. 3 sq. ft. $58\frac{1}{20}$ sq. in.

Ex. 7. $\frac{3}{7}$ mi. × 320 = $137\frac{1}{7}$ rd.;
$\frac{1}{7}$ rd. × $16\frac{1}{2}$ = $2\frac{2\frac{1}{2}}{7}$ ft.; $\frac{2\frac{1}{2}}{7}$ ft. × 12 = $4\frac{2}{7}$ in.;
Ans. 137 rd. 2 ft. $4\frac{2}{7}$ in.

Ex. 8. $\frac{4}{7}$ great-gross × 12 = $6\frac{6}{7}$ gross;
$\frac{6}{7}$ gross × 12 = $10\frac{2}{7}$ doz.; $\frac{2}{7}$ doz. × 12 = $3\frac{3}{7}$ units;
Ans. 6 gross 10 doz. $3\frac{3}{7}$ units.

Ex. 9. $\frac{9}{16}$ great circle × 360 × 60 = 12150 mi., *Ans.*

Ex. 10. $\frac{27}{8}$ Cd. × $\frac{4}{5}$ = $2\frac{7}{10}$ Cd.; $\frac{7}{10}$ Cd. × 8 = $5\frac{6}{10}$ cd. ft.;
$\frac{6}{10}$ cd. ft. × 16 = $9\frac{3}{5}$ cu. ft.;
Ans. 2 Cd. 5 cd. ft. $9\frac{3}{5}$ cu. ft.

Ex. 11. 438 mi. × $\frac{3}{5}$ = $262\frac{4}{5}$ mi.; $\frac{4}{5}$ mi. × 320 = 256 rd.;
Ans. 262 mi. 256 rd.

Ex. 12. $\frac{43}{96}$ f ℥ × 8 = $3\frac{7}{12}$ f ʒ; $\frac{7}{12}$ f ʒ × 60 = 35 ♏;
Ans. 3 f ʒ 35 ♏

Ex. 13. $\frac{3}{7}$ S. × 30 = $12\frac{6}{7}$°; $\frac{6}{7}$° × 60 = $51\frac{3}{7}$′; $\frac{3}{7}$′ × 60 = $25\frac{5}{7}$″;
Ans. 12° 51′ $25\frac{5}{7}$″

Ex. 14 $\frac{7}{13}$ hhd. × 63 = $33\frac{12}{13}$ gal.; $\frac{12}{13}$ gal. × 4 = $3\frac{9}{13}$ qt.;
$\frac{9}{13}$ qt. × 2 = $1\frac{5}{13}$ pt.; $\frac{5}{13}$ pt. × 4 = $1\frac{7}{13}$ gi.;
Ans. 33 gal. 3 qt. 1 pt. $1\frac{7}{13}$ gi.

(**370**, page 198.)

Ex 1. .645 da. × 24 = 15.48 h.; .48 h. × 60 = 28.8 min.;
.8 min. × 60 = 48 sec.; *Ans.* 15 h. 28 min. 48 sec.

Ex 2 .765 lb. × 12 = 9.18 oz.; .18 oz. × 20 = 3.6 pwt.;
.6 pwt × 24 = 14.4 gr. *Ans.* 9 oz. 3 pwt. 14.4 gr

Ex. 3. .6625 mi. × 320 = 212 rods;
Ans. 212 rd.

Ex. 4. .8469° × 60 = 50.814′; .814′ × 60 = 48.84″;
Ans. 50′ 48.84″.

Ex. 5. .875 hhd. × 63 = 55.125 gal.; .125 gal. × 8 = 1 pt.;
Ans. 55 gal. 1 pt.

Ex. 6. £.85251 × 20 = 17.0502 s.; .0502 s. × 12 = .6024 d.;
.6024 d. × 4 = 2.4096 far.; *Ans.* 17 s. 2.4 + far.

Ex. 7. .715° × 60 = 42.9′; .9′ × 60 = 54″; *Ans.* 42′ 54″.

Ex. 8. 7.88125 A. × 160 = 141 P.;
Ans. 7 A. 141 P.

Ex. 9. .625 fath. × 6 = 3.75 ft. = 3¾ ft., *Ans.*

Ex. 10. .375625 bbl. × 200 = 75.125 lb.; .125 lb. × 16 = 2 oz.,
Ans. 75 lb. 2 oz.

Ex. 11. .1150390625 Cong. × 8 = .9203125 O.;
.9203125 O. × 16 = 14.725 f℥; .725 f℥ × 8 = 5.8 fʒ,
8 fʒ × 60 = 48 ♏; *Ans.* 14 f℥ 5 fʒ 48 ♏.

Ex. 12. .61 tun × 2 = 1.22 P.; .22 P. × 2 = .44 hhd.;
.44 hhd. × 63 = 27.72 gal.; .72 gal. × 4 = 2.88 qt.;
.88 qt. × 2 = 1.76 pt.; .76 pt. × 4 = 3.04 gi.;
Ans. 1 P. 27 gal. 2 qt. 1 pt. 3.04 gi.

REDUCTION ASCENDING.

(**371**, page 200.)

Ex. 1. 1913551 oz. ÷ 16 = 119596 lb. 15 oz.; 119596 lb.
÷ 100 = 1195 cwt. 96 lb.; 1195 cwt. ÷ 20 = 59 T.
15 cwt.; *Ans.* 159 T. 15 cwt. 96 lb. 15 oz.

(198—200)

Ex. 2. 97920 gr.÷20=4896 sc.; 4896 sc.÷3=1632 dr.
1632 dr.÷8=204 oz.;
204 oz.÷12=17 lb., *Ans.*

Ex. 3. 1000000 in.÷12=83333 ft. 4 in.;
83333 ft.÷3=27777 yd. 2 ft.;
27777 yd.÷$5\frac{1}{2}$=5050 rd. 2 yd.;
5050 rd.÷320=15 mi. 250 rd.;
Ans. 15 mi. 250 rd. 2 yd. 2 ft. 4 in.

Ex. 4. 120×56=6720 sq. rd.;
6720 sq. rd.÷160=42 A., *Ans.*

Ex. 5. 60×15×10=9000 cu. ft.;
9000 cu. ft.÷16=562 cd. ft. 8 cu. ft.;
562 cd. ft.÷8=70 Cd. 2 cd. ft.;
Ans. 70 Cd. 2 cd. ft. 8 cu. ft.

Ex. 6. 28 ft. 6 in.=342 in.; 6 ft.=72 in.;
342÷72=$4\frac{3}{4}$ fath., *Ans.* Or,
28 ft. 6 in.=$28\frac{1}{2}$ ft.; $28\frac{1}{2}$÷6=$4\frac{3}{4}$ fath., *Ans.*

Ex. 7. 30876 gi.÷4=7719 pt.;
7719 pt.÷2=3859 qt. 1 pt.;
3859 qt.÷4=964 gal. 3 qt.;
964 gal.÷63=15 hhd. 19 gal.;
Ans. 15 hhd. 19 gal. 3 qt. 1 pt

Ex. 8. 27072 qt.÷8=3384 pk.; 3384 pk.÷4=846 bu., *Ans.*

Ex. 9. 254÷2=127 gi.; 127 gi.÷4=31 pt. 3 gi.;
31 pt.÷2=15 qt. 1 pt.; 15 qt.÷4=3 gal. 3 qt.;
Ans. 3 gal. 3 qt. 1 pt. 3 gi

Ex. 10. 1234567 far.÷4=308641 d. 3 far.;
308641 d.÷12=25720 s. 1 d.;
25720 s.÷20=£1286; *Ans.* £1286 1 d. 3 far.

Ex. 11. One half crown=2 s. 6 d.=30 d.;
2468÷30=$82\frac{4}{15}$ half crowns, *Ans.*

Ex. 12. $88.350÷$.186=475 francs, *Ans.*

Ex. 13. 622080 cu. in.÷1728=360 cu. ft.;
360 cu. ft.÷40=9 T., *Ans.*

Ex. 14. 84621 ♏ ÷60=1410 f ʒ 21 ♏; 1410 f ʒ÷8=
176 f ℥ 2 f ʒ; 176 f ℥÷16=11 O.; 11 O.÷8=1
Cong. 3 O.; *Ans.* 1 Cong. 3 O. 2 f ʒ 21 ♏.

Ex. 15. 135000000÷1728=78125 great-gross, *Ans.*

Ex 16 1020300″÷60=17005′; 17005′÷60=283° 25′;
283°÷30=9 S. 13°; *Ans.* 9 S. 13° 25′

Ex. 17. 411405 sec.÷60=6856 min. 45 sec.; 6856 min.÷
60=114 h. 16 min.; 114 h.÷24=4 da. 18 h;
Ans. 4 da. 18 h. 16 min. 45 sec.

Ex. 18. 412′÷60=6° 52′, *Ans.*

Ex. 19. 360°×60=21600′; 21600′×20=432000 min. of
time; 432000 min.÷60=7200 h.; 7200 h.÷24
300 da., *Ans.*

Ex. 20. 120×144=17280; 17280÷20=864, *Ans.*

Ex. 21. 180°×69.16=12448.8 mi., *Ans.*

Ex. 22. 45 min.+25 min.=70 min. gained each day;
36 yr.×365+9 da.=13149 da.;
13149 da.×70=920430 min.;
920430 min.÷60=15340 h. 30 min.;
15340 h.÷24=639 da. 4 h.;
Ans. 639 da. 4 h. 30 min

Ex. 23. 20×4=80 qt. bought.;
20×282=5640 cu. in.; 5640÷57¾=97$\frac{51}{77}$ qt. sold;
97$\frac{51}{77}$ qt.—80 qt.=17$\frac{51}{77}$ qt. gained, *Ans.*

Ex. 24. 1500 bu.×35=52500 lb.;
52500 lb.÷28=1875 bu., *Ans.*

Ex. 25. 120 lea. × 3 × 1.152⅔=414.96 mi., *Ans.*

(200, 201)

Ex. 26. 1 bbl. 1 gal. 2 qt.=33 gal.;
33 gal.×231=7623 cu. in.;
7623 cu. in.÷282=$27\frac{3}{94}$ beer gal., *Ans.*

Ex. 27 150 bu.×2150.4=322560 cu. in.;
322560÷2218.2=145.415+ Imp. bushels, *Ans.*

Ex. 28. 68 ft. 8 in.=$68\frac{2}{3}$ ft.; $68\frac{2}{3}$×33=2266 sq. ft.;
2266 sq. ft.÷100=$22\frac{33}{50}$ squares, *Ans.*

Ex 29. 4 ft.=48 in.; 3 ft.=36 in.; 1 ft. 6 in.=18 in.;
48×36×18=31104 cu. in., *Ans.*

Ex. 30. 120×56=6720 P.; 6720 P.÷160=42 A., *Ans.*

Ex. 31. 356 dr.×3×20=21360 gr.;
21360 gr.÷24=890 pwt.; 890 pwt.÷20=44 oz. 10 pwt.; 44 oz.÷12=3 lb. 8 oz.;
Ans. 3 lb. 8 oz. 10 pwt.

Ex. 32. 175 T.×2240=392000 lb.; 392000÷2000=196 T., short ton weight; $3.75 × 175 = $656.25, cost;
$4.50×196=$882, sold for;
$882—$656.25=$225.75 gain, *Ans.*

Ex. 33. 73750÷1.25=59000 sq. ft.;
59000 sq. ft.÷$272\frac{1}{4}$=216 P. 194 sq. ft.; 216 P. ÷160=1 A. 56 P.; *Ans.* 1 A. 56 P. 194 sq. ft.

Ex 34. 2492 lb.÷56=44.5 bushels of corn;
2175 lb.÷60=36.25 bushels of wheat;
$.60×44.5=$26.70; $1.20×36.25=$43.50;
$26.70+$43.50=$70.20, *Ans.*

Ex 39.

$$\begin{array}{r|l} & 75 \\ 72 & 42 \\ \hline 4 & 175 \end{array}$$

$43.75, *Ans.*

Ex. 40.

$$\begin{array}{r|l} & 5 \\ & 6 \\ 90 & 76 \\ \hline 3 & 76 \end{array}$$

Ans. $$25.33\frac{1}{3}$

Ex. 41.

$$\begin{array}{r|l} & 2 \\ & 126 \\ 21 & 2 \\ \hline \end{array}$$

24 lb., *Ans.*

Ex. 42. $\frac{54\times70}{72}=\$52.50$, rated at in Vermont;
$\$52.50+\$7.50=\$60$, to be sold for in New Jersey;
$\frac{60\times90}{54}=100$d.$=$8s. 4d. *Ans.*

(**372**, page 203.)

Ex. 1. $\frac{2}{9}$ s.$\times\frac{1}{20}=£\frac{1}{90}$, *Ans.*
Ex. 2. $\frac{5}{7}$ pwt.$\times\frac{1}{20}\times\frac{1}{12}=\frac{1}{336}$ lb., *Ans.*
Ex. 3. $\frac{4}{5}$ lb.$\times\frac{1}{2000}=\frac{1}{2500}$ T., *Ans.*
Ex. 4. $\frac{4}{9}\times\frac{20}{1}$ sec.$\times\frac{1}{60}\times\frac{1}{60}=\frac{1}{405}$ h., *Ans.*
Ex. 5. $\frac{3}{5}$ pt.$\times\frac{1}{2}\times\frac{1}{4}\times\frac{1}{63}=\frac{1}{840}$ hhd;
$\frac{1}{630}$ hhd.$-\frac{1}{840}$ hhd.$=\frac{1}{2520}$ hhd., *Ans.*
Ex. 6. $\frac{224}{3}\times\frac{1}{3}\times\frac{2}{7}$ pt.$\times\frac{1}{2}\times\frac{1}{8}=\frac{4}{9}$ pk.$=\frac{2}{9}$ of 2 pk., *Ans.*
Ex. 7. $\frac{2}{3}\times\frac{4}{7}\times\frac{9}{14}$ cd. ft.$\times\frac{1}{8}=\frac{3}{98}$ Cd., *Ans.*
Ex. 8. $\frac{3}{19}\times\frac{4}{17}\times\frac{19}{2}$ P.$\times\frac{1}{160}=\frac{3}{1360}$ A., *Ans.*
Ex. 9. $\frac{3}{4}\times\frac{220}{1}\times\frac{2}{1}\times\frac{12}{1}\times\frac{1}{320}=12\frac{3}{8}$ mi., *Ans.*
Ex. 10. $\frac{3}{4}\times\frac{6}{7}\times\frac{121}{6}$ cu. ft. $\times\frac{4}{99}=\frac{11}{21}$ Pch., *Ans.*
Ex. 11. $\frac{15}{2}\times\frac{2}{1}\times\frac{13}{4}$ cu. ft. $\times\frac{1}{128}=\frac{195}{512}$ Cd., *Ans.*
Ex. 12. $\frac{5}{7}$ in. $\times\frac{1}{45}=\frac{1}{63}$ yd., *Ans.*

(**373**, page 205.)

Ex. 1. 100 P.; 1 A.$=$160 P.;
$\frac{100}{160}$ A.$=\frac{5}{8}$ A., *Ans.*

Ex. 2. 146 rd. 3 yd. 2 ft.$=$4400 ft.; 1 mi.$=$5280 ft.;

Ex. 3. 18 s. 5 d. $2\frac{2}{13}$ far.$=\frac{11520}{13}$ far.; £1$=$960 d.;
$£\frac{11520}{13}\times\frac{1}{960}=£\frac{12}{13}$, *Ans.*

Ex. 4. 7 ℥ 7 ʒ 2 ℈ 14 gr. = 3834 gr.; 21 ℔. = 120960 gr.,
$\frac{3834}{120960}=\frac{71}{2240}$, *Ans.*

Ex. 5. 4 da. 16 h. 30 min. = 6750 min; 3 wk. = 30240 min.;
$\frac{6750}{30240}=\frac{25}{112}$, *Ans.*

Ex. 6. $\frac{1\frac{3}{4}}{4}$ bu. $=\frac{7}{16}$ bu., *Ans.*

Ex. 7. 28 gal. 2 qt. = 114 qt.; 1 hhd. = 252 qt.;
252 qt. — 114 qt. = 138 qt.; $\frac{138}{252}=\frac{23}{42}$, *Ans.*

Ex. 8. 4 bundles 6 quires 16 sheets = 4000 sheets;
1 bale = 4800 sheets; $\frac{4000}{4800}$ bales $=\frac{5}{6}$ of a bale, *Ans*

Ex. 9. $\frac{4800}{54\times128}=\frac{25}{36}$, *Ans.*

Ex. 10. $\$\frac{7\frac{4}{11}}{1\frac{13}{77}}=\$\frac{81}{11}\times\frac{77}{90}=\$6\frac{3}{10}=\$6.30$, *Ans.*

Ex. 11. 3 O. 3 f℥ 1 fʒ 36 ♏ = 24576 ♏;
1 Cong. = 61440 ♏; $\frac{24576}{61440}$ Cong. $=\frac{2}{5}$ Cong., *Ans.*

Ex. 12. 36 cu. ft. 864 cu. in. = 63072 cu. in.;
1 T. = 50 cu. ft. = 86400 cu. in.;
$\frac{63072}{86400}=\frac{73}{100}$ T., *Ans.*

(374, page 206.)

Ex 1.

60	48.0 sec.
60	46.80 min.
24	9.78 h.
7	5.4075 da.
Ans.	.7725 wk.

Ex. 2.

60	46.44′
60	27.774′
30	3.4629°
Ans.	.11543 S

Ex. 3.

$$\begin{array}{r|l} 160 & 51.52\text{ P.} \\ \hline \textit{Ans.} & .322\text{ A.} \end{array}$$

Ex. 4.

$$\begin{array}{r|l} 24 & 19.2\text{ gr} \\ \cline{2-2} 20 & 16.8\text{ pwt.} \\ \cline{2-2} 4 & 2.84\text{ oz.} \\ \hline \textit{Ans.} & .71 \end{array}$$

Ex. 5.

$$\begin{array}{r|l} 12 & 11.04\text{ in.} \\ \cline{2-2} 3 & 1.92\text{ ft.} \\ \cline{2-2} 5.5 & 2.64\text{ yd.} \\ \cline{2-2} 320 & 28.48\text{ rd.} \\ \hline \textit{Ans.} & .089\text{ mi.} \end{array}$$

Ex. 6. 3.25 ℥ ÷12=$.2708\dot{3}$ lb.

Ex. 7.

$$\begin{array}{r|l} 16 & 12.00\text{ P.} \\ \cline{2-2} 10 & 4.75\text{ sq. ch.} \\ \cline{2-2} 23040 & 126.475\text{ A.} \\ \hline \textit{Ans.} & .0054893+\text{Tp.} \end{array}$$

Ex. 8. 3.75 ft.÷6=.625 fath., *Ans.*

Ex. 9. .45 pk.÷4=.1125 bu.; .1125÷1.25=.09, *Ans.*

Ex. 10. 3 A. 80 P.=560 P.; 51.52 P.;
51.52÷560=.092, *Ans.*

Ex. 11. $\frac{2}{7}\times\frac{1}{2}\times\frac{91}{4}\times\frac{1}{2000}=.001625$, *Ans.*

Ex. 12.

$$\begin{array}{r|l} 60 & 36.00\text{ ♏} \\ \cline{2-2} 8 & 5.6\text{ f ʒ} \\ \hline \textit{Ans} & .7\text{ f ℥} \end{array}$$

Ex. 13.

$$\begin{array}{r|l} 2 & 1.0\text{ pt.} \\ \cline{2-2} 4 & 3.5\text{ qt.} \\ \cline{2-2} 252 & 50.875\text{ gal.} \\ \hline \textit{Ans.} & .20188+\text{T.} \end{array}$$

ADDITION.

(377, page 208.)

Ex. 3. *Ans.* 3 mi. 2 fur. 27 rd. 16 ft.

Ex. 4. *Ans.* 1016 A. 26 P. 15 sq. yd. 5 sq. ft. 72 sq. in.

Ex. 7. *Ans.* 15 Cd. 4 cd. ft. 8 cu. ft.

Ex. 8. 1⅔ hhd. =1 hhd. 42 gal.
42 gal. 3 qt. 1¼ pt. = 42 " 3 qt. 1 pt. 1 gi.
⅞ gal. = 3 " 1 "
2 qt. ¾ pt. = 2 " 0 " 3 "
1.75 pt. = 1 " 3 "
Ans. 2 hhd. 23 gal. 2 qt. 0 pt. 3 gi.

Ex. 9. 145⅞ A. =145 A. 140 P.
7 " 109½ "
1 " 136½ "
⅚ A. = 133⅓ "
156 A. 39⅓ P., *Ans.*

Ex 10. 31 bu. 2 pk.
10⅞ bu. =10 " 3 " 4 qt.
5 bu. 6½ qt. = 5 " 0 " 6 " 1 pt.
14 bu. 2.75 pk. =14 " 2 " 6 "
⅔ pk. = 5 " ⅔ "
62 bu. 1 pk. 5 qt. 1⅔ pt., *Ans.*

Ex. 11. 42 yr. 7½ mo. =42 yr. 7 mo. 15 da.
10 yr. 3 wk. 5 da. =10 " 0 " 26 "
9¾ mo. = 9 " 22 " 12 h.
1 wk. 16 h. 40 min. = 7 " 16 " 40 min
⅚ mo. = 25 "
8⅘ da. = 3 " 19 " 12 min.
Ans. 53 yr. 7 mo. 9 da. 23 h. 52 min.

Ex. 13. 1½ gross 7⅓ doz. = 304
3 " 1¾ " = 453
¾ great-gross =1296
6¼ doz. = 75
4 doz. 7 units = 55
2183, *Ans.*

Ex. 15. $3\frac{1}{3}$ Pch. 18 cu. ft.=4 Pch. 1 cu ft. 864 cu. in
84.6 cu. ft. =3 " 10 " 604.8 "
$\frac{5}{6}$ Pch. = 20 " 1080 "
$\frac{20}{27}$ cu. ft. = 1280 "

Ans. 8 Pch. 9 cu. ft. 804.8 cu in

Ex. 16. $ 3.75
25.50
12.875
2.40
2.5475

$47.0725, *Ans.*

Ex. 18. 42.4 bu.
2866 lb.= 49.414– "
$36\frac{3}{4}$ bu.= 36.75 "
39 bu. 29 lb.= 39.5 "

$.60×168.063=$100.84–, *Ans.*

Ex. 19. 1.125 T.
$1\frac{2}{5}$ T.=1.4 "
2500 lbs.=1.25 "

$8×3.775=$30.20, *Ans.*

Ex. 20 $140\frac{4}{5}$ cu. yd. =140.8 cu. yd
24.875 "
46 cu. yd. $20\frac{1}{4}$ cu. ft.= 46.75 "

212.425 cu. yd removed,
$.18×212.425=$38.24—, cost

SUBTRACTION.

(**379**, page 211.)

Ex. 3. *Ans.* 2 hhd. 54 gal. 1⅜ qt.

Ex. 4.

45 yr. 1 mo. 3 wk. 0 da. 17½ h.=45 yr. 1 mo. 21 da. 17.5 h.

10 “ 9 “ 1 “ 22 “ 6.8 “=10 “ 9 “ 29 “ 6.8 h.

Ans. 34 yr. 3 mo. 22 da. 10.7 h

Ex. 6. *Ans.* 12 cwt. 85 lb. 6 oz.

Ex. 7. 2 wk. 3⅚ da.=2 wk. 3 da. 20 h.

.659 wk. = 4 “ 14 “ 42 min. 43⅕ sec.

Ans. 1 wk. 6 da. 5 h. 17 min. 16⅘ sec.

Ex. 8. $\frac{117}{224}$ hhd.=32.90625 gal.

.90625 “

32 gal., *Ans.*

Ex. 9. ⅜ of 3⅔ A.=1 A. 60 P.

132.56 “

87.44 P., *Ans.*

Ex. 10. 10 lb. 8 oz. 8 pwt.

$\frac{3}{40}$ lb.= 18 “

10 lb. 7 oz. 10 pwt., *Ans.*

Ex. 11. 36 Cd. 4 cd. ft.

10 “ 6 “ 12 cu. ft.

25 Cd. 5 cd. ft. 4 cu. ft., *Ans.*

Ex. 12. 5½ bbl.=5 bbl. 15 gal. 3 qt.

$\frac{4}{7}$ hhd.=1 “ 4 “ 2 “

4 bbl. 11 gal. 1 qt., *Ans.*

Ex. 13. $\frac{2}{3}$ wk. = 4 da. 16 h.
$\frac{607}{960}$ da. = 15 " 10 min. 30 sec.

4 da. 0 h. 49 min. 30 sec., *Ans.*

Ex. 14. $\frac{5}{8}$ gross = $7\frac{1}{2}$ doz.;
$7\frac{1}{2}$ doz. — $\frac{2}{3}$ doz. = $6\frac{5}{6}$ doz., *Ans.*

Ex. 15. $\frac{7}{9}$ mi. = 248 rd. 4 yd. 2 ft. 8 in.
$\frac{21}{22}$ rd. = 5 " 0 " 9 "

247 rd. $4\frac{1}{2}$ yd. 1 ft. 11 in.;
Or, 247 rd. 5 yd. 0 ft. 5 in., *Ans.*

Ex. 17. $\frac{3}{4}$ pk. = 6 qt.; .0625 bu. = 2 qt.;
6 qt. — 2 qt. = 4 qt., *Ans.*

Ex. 18. $\frac{5}{9}$ of $365\frac{1}{4}$ da. = 28 wk. 6 da. 22 h.
$\frac{3}{4}$ of $5\frac{5}{9}$ wk. = 4 " 1 " 4 "

33 wk. 1 da. 2 h. — $49\frac{1}{7}$ min. =
33 wk. 1 da. 1 h. $10\frac{6}{7}$ min., *Ans.*

Ex. 19. $\frac{3}{7}$ of $3\frac{3}{4}$ mi. + $17\frac{1}{7}$ rd. = 1 mi. 40 rd.;
1 mi. 40 rd. — $213\frac{1}{3}$ rd. = $106\frac{2}{3}$ rd., *Ans.*

Ex. 20. 15 bbl. 3.25 gal. = 15 bbl. 3 gal. 1 qt.
14 " 24 " 3.54 "

$9\frac{1}{2}$ gal. 1.46 qt.;
Or, 9 gal. 3.46 qt., *Ans.*

Ex. 21. 1457 lb. + 1578 lb. + 1420 lb. = 4455 lb.
= 92 bu. 39 lb.; 200 bu. — 92 bu. 39 lb.
= 107 bu. 9 lb., *Ans.*

Ex. 22 50 A. 136.4 P.
48 " 123.3 "

200 A. — 99 A. 99.7 P. = 100 A. 60.3 P.
= 100.376875 A.; \$35 × 100.376875
= \$3513.19+, *Ans.*

(211, 212)

Ex. 23. 58×37×6=12876 cu. ft.=476 cu. yd. 24 cu. ft.;

476 cu. yd. 24 cu. ft.
471 " 16 " 972 cu. in.

Ans. 5 cu. yd. 7 cu. ft. 756 cu. in.

Ex. 24. $\frac{4}{5}$ lb.= 9 oz. 12 pwt.
$4\frac{5}{6}$ oz.= 4 " 16 " 16 gr.
$31\frac{1}{3}$ pwt.= 1 " 11 " 8 gr.

1 lb. 4 oz. 0 pwt. 0 gr.
11 " 3 "

1 lb. 3 oz. 8 pwt. 21 gr., *Ans.*

$\frac{3}{5}$ oz. =12 pwt.
$\frac{7}{8}$ pwt.= 0 " 21 gr.

11 pwt. 3 gr.

Ex. 25. $5\frac{7}{12}$ A.=5 A. 93 P. $10\frac{1}{12}$ sq. yd.
$\frac{2}{3}$ of $6\frac{1}{4}$ A.=4 " 26 " $20\frac{1}{6}$ "
30 "
$\frac{3}{11}$ of $2\frac{2}{11}$ P.= 18 "

9 A. 150 P. 18 sq. yd.
4 " 25 P. 12 "

5 A. 125 P. 6 sq. yd.

(380, page 213.)

Ex. 1. 1783 yr. 1 mo. 20 da.
1775 " 4 " 19 "

Ans. 7 yr. 9 mo. 1 da.

Ex. 2. 1732 yr. 2 mo. 22 da.
1620 " 12 " 22 "

111 yr. 2 mo., *Ans.*

Ex. 3. 1860 yr. 7 mo. 4 da.
1607 " 5 " 23 "

Ans. 253 yr. 1 mo. 11 da.

Ex. 4. 1861 yr. 6 mo 8 da.
1859 " 1 " 30 "

Ans. 2 yr. 4 mo. 8 da.

Ex 6 From July 4, 1855, to July 4, 1860, is 366 da. +365 da.+365 da.+365 da.+366 da.=1827 da.; From July 4, 1860, to Dec. 12, 1860, is 27 da. +31 da.+30 da.+31 da.+30 da.+12 da.=161 da.; from 16 minutes past 10 o'clock A. M., to 22 minutes before 8 o'clock P. M., is 9 h. 22 min.; hence 1827 da.+161 da.+9 h. 22 min. =1988 da. 9 h. 22 min., *Ans.*

Ex. 7.

1862 yr.	1 mo.	1 da.	4 h.	55 min.	24 sec.
1860 "	4 "	21 "	12 "	40 "	25 "
1 yr.	8 mo.	9 da.	16 h.	14 min.	59 sec.

As the full year is a common year, and the full months commence with May, the 1 yr. 8 mo. 9 da.=365 da.+31 da. +30 da.+31 da.+31 da.+30 da.+31 da.+30 da.+31 da +9 da.=619 da.; hence, 619 da. 16 h. 14 min. 59 sec., *Ans.*

Ex. 8. 27—4=23; 242 da.+23 da.=265 da., *Ans.*

MULTIPLICATION.

(**382**, page 215.)

Ex. 3. *Ans.* 44 A. 122 P. 9 sq. yd. 6 sq. ft.

Ex. 4. *Ans.* 181 Cd. 5 cd. ft. 12 cu. ft.

Ex. 5.

bu.	pk.	qt.	pt.
34	3	6	1
			2
69	3	5	
		7	
489	1	3, *Ans.*	

Ex. 6.

lb.	oz.	pwt.
4	10	18.7
		9
44	2	8.3
		3
132	7	4.9, *Ans*

	lb.	℥	ʒ	℈	gr.	
Ex. 7.		9	3	2	13	
					7	
	5	6	3	0	11	
					5	
	27	7	7	2	15,	*Ans.*

	gal.	qt.	pt.	gi.	
Ex. 8.	5	2	1	3.25	
				12	
	68	2	1	3	
				8	
	549	3			, *Ans*

	A.	P.	sq. yd.	
Ex. 9.	78	135	15	
			15⅔	
	1182	112	13¼	product by 15
	52	90	10	“ “ ⅔
	1235	42	23¼,	*Ans.*

	cu. yd.	cu. ft.	cu. in.	
Ex. 10.	9	10	1424	
			8	
	75	5	1024	product by 8;
			9	
	676	23	576	product by 8×9=72
	9	10	1424	“ “ 1
Ans.	686	7	272	“ “ 73

Ex. 11.	27 lb.	2 oz.	17 pwt	12 gr.,	product by 10
	163 “	5 “	5 “	0 “,	“ “ 10×6=60
Subtract	2 “	8 “	13 “	18 “,	“ “ 1
Ans.	160 lb.	8 oz.	11 pwt.	6 gr.,	“ “ 60—1=59

Ex. 12.	22 yd.	0 ft.	11.5 in.,	product by 5
	111 “	1 “	9.5 “,	“ “ 5×5=25
Ans.	557 “	2 “	11.5 “,	“ “ 5×5×5=125

Ex. 13. 1 qt. 2 gi.=$1\frac{1}{4}$ qt.;
$1\frac{1}{4}$ qt.×144=180 qt.=45 gal., *Ans*

Ex. 14. 5 Cong. 5 O. 15 f℥ 2 fʒ 30 ♏, prod. by 6
Ans. 22 " 7 " 13 " 2 " , " " 6×4=24

Ex. 15. 14 hhd. 46 gal. 1 qt. 0 pt. 2.4 gi., prod. by 4
58 " 59 " 1 " 0 " 1.6 ", " " 4×4=16
3 " 43 " 0 " 0 " 2.6 ", " "
Ans. 62 hhd. 39 gal. 1 qt. 1 pt. .2 gi., " " 16×1=17

Ex. 16. 9 T. 13 cwt. 1 qr. 10.5 lb.=9.6671875 T.;
9.6671875 T.×1.7=16.43421875 T.
=16 T. 8 cwt. 2 qr. 20.65 lb., *Ans.*

Ex. 17. 2 hhd. 23 gal. 2 qt. 1 pt.=2.375 hhd.;
2.375 hhd.×4.8=11.4 hhd.
=11 hhd. 25 gal. 1 pt. 2.4 gi., *Ans.*

Ex. 18. 9 oz. 13 pwt. 8 gr.×12=9 lb. 8 oz.=$9\frac{2}{3}$ lb., whole weight; $\$212.38\times9\frac{2}{3}=\$2053.00\frac{2}{3}$, *Ans.*

Ex. 19. 27 gal. 3 qt. 1 pt.=27.875 gal.;
27.875 gal.×5=139.375 gal.;
$\$1.375\times139.375=\$191.64+$, *Ans.*

Ex. 20. 37 bu. 3 pk. 5 qt.=37.90625 bu.;
37.90625 bu.×5=189.53+ bu.;
$\$.65\times189.53=\$123.20-$, *Ans.*

DIVISION.

(**383**, page 218.)

Ex. 6. *Ans.* 21 bu. 1 pk. 5 qt. 1 pt.

yd. ft. in.
Ex. 7. 3) 336 4 $3\frac{1}{3}$

7) 112 1 $5\frac{1}{9}$

16 0 $2\frac{4}{9}$, *Ans.*

Ex. 9. *Ans.* 10 cu. yd. 3 cu. ft. 428.15 cu. in.

mi. rd. yd.

Ex. 10. 9) 1986 140 1

12) 220 228 5

18 125 $4\frac{1}{12}$, *Ans.*

sq. mi. A. P.

Ex. 11. 12 0 70

2

45) 24 . 0 140

341 $56\frac{4}{9}$, *Ans.*

Ex. 12. *Ans.* 1 da. $12\frac{21}{40}$ h.

cu. yd. cu. ft. cu. in.

Ex. 13. $33\frac{1}{3}=\frac{100}{3}$; 8794 20 $709\frac{1}{3}$

3

100) 11384 7 400

113 22 1300, *Ans.*

lb ℥ ʒ ℈ gr.

Ex. 14. $13\frac{3}{4}=\frac{55}{4}$; 121 8 2 1 4

4

11) 485 1 1 1 16

5) 44 1 1 1 16

8 9 6 2 $3\frac{1}{5}$, *Ans.*

Ex. 15 28° 51′ 27.765″=28.8577125°;
28.8577125°÷2.754=$10.47847\dot{2}$°;
$10.47847\dot{2}$°=10° 28′ $42\frac{1}{2}$″, *Ans.*

$$\begin{array}{lrrl} & \text{yd.} & \text{ft.} & \text{in.} \\ \text{Ex 16.} & 202 & 1 & 6\frac{3}{4} \\ & & & 5 \\ \hline 3) & 1012 & 1 & 9\frac{3}{4} \\ \hline & 337 & 1 & 7\frac{1}{4},\ \textit{Ans.} \end{array}$$

$$\begin{array}{lrrr} & \text{da.} & \text{h.} & \text{min.} \\ \text{Ex. 17.}\ 10) & 1950 & 15 & 15\frac{5}{9} \\ \hline 10) & 195 & 1 & 31\frac{5}{9} \\ \hline \textit{Ans.} & 19 & 12 & 9\frac{7}{45} \end{array}$$

Ex. 18. 4 sq. mi.÷124=82 A. $92\frac{28}{31}$ P., *Ans.*

Ex. 19. $48\frac{1}{2}$×24×$6\frac{1}{2}$=7566 cu. ft.=280 cu. yd. 6 cu. ft.;
48)280 cu. yd. 6 cu. ft.
5 cu. yd. 22 cu. ft. 1080 cu. in., *Ans.*

Ex. 20. 2 bu. 3 pk. 6 qt.=94 qt.; 356 bu. 3 pk. 5 qt. =11421 qt.; 11421÷94=$121\frac{1}{2}$, *Ans.*

LONGITUDE AND TIME.

(**385**, page 219.)

$$\begin{array}{lllll} \text{Ex. 1.} & 9\ \text{h.} & & & \\ & 8\ \text{"} & 7\ \text{min.} & 4\ \text{sec.} & \\ \hline & & 52\ \text{min.} & 56\ \text{sec.} & \\ & & & 15 & \\ \hline & 13° & 14' & 0''\ \text{diff. lon.} & \\ & 77° & 1' & & \\ \hline & 90° & 15',\ \textit{Ans.} & & \end{array}$$

$$\begin{array}{llll} \text{Ex. 2.} & 1\ \text{h.} & 11\ \text{min.} & 56\ \text{sec.} \\ & & & 15 \\ \hline \text{Take} & 17° & 59' & \\ \text{From} & 89° & 2' & \\ \hline & 71° & 3',\ \textit{Ans.} & \end{array}$$

Ex. 3. 9 h. 13 min. 20 sec. A. M., time at the easterly place,
2 h. 30 min. A. M., " " westerly "

6 h 43 min. 20 sec., difference of time;
6 h. 43 min. 20 sec.×15=100° 50′, diff. lon.;
100° 50′—18° 28′=82° 22′ west, *Ans.*

Ex. 4. 6 h. 8 min. 28 sec.×15=92° 7′, *Ans.*

Ex 5 1 h. 18 min. 16 sec.×15=19° 34′;
94° 44′—19° 34′=75° 10′ west, *Ans.*

Ex. 6. 2 h. 58 min. $23\frac{1}{3}$ sec.×15=44° 35′ 50″, diff. in lon.;
77° 51′+44° 35′ 50″=122° 26′ 50″ west, *Ans.*

Ex. 7. 2 h. 33 min. $53\frac{14}{15}$ sec.×15=38° 28′ 29″, diff. in lon.;
71° 12′ 15″+38° 28′ 29″
=109° 40′ 44″ west, *Ans.*

Ex. 8. 5 h. 40 min. 20 sec.×15=85° 5′ west, *Ans.*

Ex. 9. 12 h.—5 h. 51 min. $41\frac{3}{5}$ sec.=6 h. 8 min. $18\frac{2}{5}$ sec., diff. time; 6 h. 8 min. $18\frac{2}{5}$ sec.×15=92° 4′ 36″, diff. in lon.; 92° 4′ 36″—18° 3′ 30″
=74° 1′ 6″ west, *Ans.*

Ex. 10.
8 h. 53 min. 47 sec.
3.56 sec.×24= 1 " 25.44 "

Take 8 h. 52 min. 21.56 sec. { true time at N. York;
From 10 " 4 " 36.80 " ship's time;

1 h. 12 min. 15.24 sec., diff. time;
1 h. 12 min. 15.24 sec.×15=18° 3′ 48.6″, *Ans.*

(**386**, page 221.)

Ex 1. 84° 24′—77° 1′=7° 23′, diff. in longitude;
7° 23′÷15=29 min. 32 sec., diff. in time, *Ans.*

Ex. 2. 113° 14′—2° 20′=110° 54′, diff. in longitude;
110° 54′÷15=7 h. 23 min. 36 sec., *Ans.*

Ex. 3. 78° 55′+20° 30′=99° 25′, diff. in lon.;
99° 25′÷15=6 h. 37 min. 40 sec., *Ans.*

Ex. 4. 74° 1′—63° 36′=10° 25′, diff. in lon.;
10° 25′÷15=41 min. 40 sec., diff. in time;
4 h. 30 min. P. M.—41 min. 40 sec.
=3 h. 48 min. 20 sec. P. M., *Ans.*

Ex. 5. 71° 7′+5′ 2″=71° 12′ 2″, diff. in lon.;
71° 12′ 2″÷15=4 h. 44 min. 48$\frac{2}{15}$ sec., diff in time; 12 h. M.—4 h. 44 min. 48$\frac{2}{15}$ sec.
=7 h. 15 min. 11$\frac{13}{15}$ sec. A. M., *Ans.*

Ex. 6.
118°+120°=238°, diff. in lon. reckoned west from Pekin;
360°—238°=122°, " " " " " Sacramento;
238°÷15=15 h. 52 min., Sacramento earlier than Pekin; or
122°÷15= 8 h. 8 min. " later " "

Ex. 7. 35° 32′+76° 37′=112° 9′, diff. in lon.;
112° 9′÷15=7 h. 28 min. 36 sec., diff. in time;
6 h. 40 min. A. M.+7 h. 28 min. 36 sec.
=2 h. 8 min. 36 sec. P. M., *Ans.*

Ex. 8. 6 h. P. M.—7 h. 28 min. 36 sec.
=10 h. 31 min. 24 sec. A. M., *Ans.*

NOTE.—We always subtract the difference of time from the time at the easterly place to obtain the time at the westerly place, adding 12 h. to the minuend if necessary to make the subtraction possible; and we always add the difference of time to the westerly place to obtain the time at the easterly place, rejecting 12 h. when the amount exceeds this time. And whenever 12 h are borrowed in subtracting, or rejected in adding, the time changes from A. M to P. M., or from P. M. to A. M.

Ex 9. 94° 46′ 34″—72° 35′ 45″=22° 10′ 49″, diff. in lon.
22° 10′ 49″÷15=1 h. 28 min. $43\frac{4}{15}$ sec., diff. in
time; 6 h. 20 min. A. M.—1 h. 28 min. $43\frac{4}{15}$ sec.
=4 h. 51 min. $16\frac{11}{15}$ sec. A. M., *Ans.*

Ex. 10. 28° 49′+93° 5′=121° 54′, diff. in lon.,
121° 54′÷15=8 h. 7 min. 36 sec., diff. in time;
3 h. P. M.+8 h. 7 min. 36 sec.
=11 h. 7 min. 36 sec. P. M., *Ans.*

Ex. 11. 12 h. M.—8 h. 7 min. 36 sec.
=3 h. 52 min. 24 sec. P. M., *Ans.*

Ex. 12. 88° 1′ 29″+5′ 2″=88° 6′ 31″, diff. in lon.;
88° 6′ 31″÷15=5 h. 52 min. $26\frac{1}{15}$ sec., diff. in
time; 12 h. M.+5 h. 52 min. $26\frac{1}{15}$ sec.
=5 h. 52 min. $26\frac{1}{15}$ P. M., *Ans.*

PROMISCUOUS EXAMPLES IN COMPOUND NUMBERS.

(Page 222.)

Ex. 1. *Ans.* 55799 gr.

Ex. 2. 3 cwt. 12 lb.=.156 T.; $15.50×.156=$2.418, *Ans.*

Ex. 3. 27 yd. 2 qr.=110 qr.; 110 qr.÷5=22 ells, *Ans.*

Ex. 4. $18.945÷$4.84=£3.914256
=£3 18 s. 3 d. 1.6+qr., *Ans.*

Ex. 5. *Ans.* 130413645 sec.

Ex. 6. 24 sheets×8×2=384 pages, *Ans.*

Ex. 7. 1 s. 6 d.=18 d.; £5 6 s. 6 d.=1278 d.;
1278÷18=71 yd., *Ans.*

Ex. 8. *Ans.* 37173 l.

Ex. 9. *Ans.* 111111 sq. yd.

Ex. 10. 3 gal. 1 qt. 1 pt.=27 pt.; 3 hhd.=1512 pt.;
1512 pt.÷27 pt.=56, *Ans.*

Ex. 11 $2\frac{1}{2}$ T.=5000 lb.; \$.095×5000=\$475, sold for;
\$475—\$375.75=\$99.25, *Ans.*

Ex. 12 3 lb. 9 oz.=900 pwt.; 1 oz. 5 pwt.=25 pwt.;
900÷25=36=3 doz., *Ans.*

Ex. 13 4 gal. 3 qt.=152 gi.; 2 qt. 1 pt. 2 gi.=22 gi.;
$\frac{22}{152}=\frac{11}{76}$, *Ans.*

Ex. 14. $\frac{3}{7}\times\frac{4}{11}$ rd.$\times\frac{11}{2}=\frac{6}{7}$ yd., *Ans.*

Ex. 15. $26\frac{1}{2}\times20=530$ sq. ft.$=58\frac{8}{9}$ sq. yd.$=58\frac{8}{9}$ yd., *Ans*

Ex. 16. 15 T. 3 cwt. 3 qr. 24 lb. long ton weight=34044
lb.=17.022 T. short ton weight; hence
\$140×17.022=\$2383.08, sold for;
\$ .06× 34044=\$2042.64, cost;

\$340.44 gained, *Ans.*

Ex. 17. (40 ft.+$36\frac{1}{2}$ ft.)×2=153 ft., round the room;
$153\times22\frac{1}{4}=3404\frac{1}{4}$ sq. ft. in the walls;
$36\frac{1}{2}\times40=1460$ sq. ft. in the ceiling;
$3404\frac{1}{4}$ sq. ft.+1460 sq. ft.—1375 sq. ft.=$3489\frac{1}{4}$ sq
ft. to be paid for, at $\frac{18}{9}=2$ cents per sq. ft.;
hence $3489\frac{1}{4}\times2=$\$69.785, *Ans.*

Ex. 18. 78 lb. 9 oz.×23=18 cwt. 6 lb. 15 oz., *Ans.*

Ex. 19 33° 2′+30° 41′=63° 43′, *Ans.*

Ex. 20 1 gross 4 doz.=16 doz.;
16 doz.×31=496 doz., *Ans.*

Ex. 21. 4 sq. rd. 120 sq. ft. 84 sq. in.×18
=79 sq. rd. $264\frac{1}{4}$ sq. ft. 72 sq. in.;
160 sq. rd.—79 sq. rd. $262\frac{1}{4}$ sq. ft. 72 sq. in.
=80 sq rd. 7 sq. ft. 72 sq. in., *Ans.*

Ex. 22 \$12.025÷\$13=.925 T.=1850 lb., *Ans.*

Ex. 23 1 pk. 4 qt.=.375 bu.; \$.72÷.375=\$1.92, *Ans.*

Ex. 24. 36244 lb.÷60=$604\frac{1}{15}$ bu., *Ans.*

(222, 223)

Ex 25. $32\times24\times6=4608$ cu. ft.$=170\frac{2}{3}$ cu. yd.;
$\$.20\times170\frac{2}{3}=\$34.13+$, *Ans.*

Ex. 26. (32 ft.+24 ft.)$\times2=112$ ft., mason's girt;
$112\times6\times1\frac{1}{2}=1008$ cu. ft.$=40\frac{8}{11}$ Pch.;
$\$1.25\times40\frac{8}{11}=\$50.90\frac{10}{11}$, *Ans.*

Ex. 27. 1 mi.$=5280$ ft.; 10 ft. 4 in.$=10\frac{1}{3}$ ft.;
$\frac{248}{1}\times\frac{5280}{1}\times\frac{3}{31}=126720$ times, hind wheels;
$\frac{248}{1}\times\frac{5280}{1}\times\frac{2}{31}=\ \ 84480$ " forward "

42240 times, *Ans.*

Ex. 28. $\$3.75\times15.22=\$57.075$
$4.25\times\ \ 7.36=\ \ 81.28$

\$88.355 cost;
$\$.045\times2258=$ 101.61 sold for;

\$13.255, *Ans.*

Ex. 29. $\frac{5}{7}$ of 3 T. 10 cwt. $=5000$ lb.
$\frac{4}{13}$ of 7 T. 3 cwt. 26 lb.$=4408$ lb.

592 lb., *Ans.*

Ex. 30. 16 lb. 5 oz. 10 pwt. 13 gr. Troy$=94813$ gr.,
94813 gr.$\div7000=13.5447+$lb. Avoirdupois;
13.5447+lb.$=13$ lb. 8 oz. 11.4+dr., *Ans.*

Ex. 31. 1 ft. 7.8 in.$=1.65$ ft.$=.1$ rd., *Ans.*

Ex. 32. 9 in.$=\frac{3}{4}$ ft.; 6 in.$=\frac{1}{2}$ ft.;
$\frac{3}{1}\times\frac{4}{3}\times\frac{2}{1}=8$ ft., *Ans.*

Ex. 33. 16 in.$=\frac{4}{3}$ ft.; $7\times\frac{3}{4}=5\frac{1}{4}$ ft., *Ans.*

Ex. 34. 17280 cu. in.$\div268\frac{4}{5}=64\frac{2}{7}$ gallons, dry measure;
17280 cu. in.$\div282\ =61\frac{13}{47}$ " beer "

Difference $3\frac{3}{329}$ gallons, *Ans.*

(223, 224)

Ex. 35. $\frac{60}{1}\times\frac{7}{4}\times\frac{13}{12}$ ft. $\times\frac{1}{50}=2.275$ tons, *Ans.*

Ex. 36. $\dfrac{7\frac{1}{2}}{8\frac{1}{3}}$ bu. $=3$ pk. $4\frac{4}{5}$ qt.; $\frac{5}{8}\times\frac{56}{75}\times\frac{10}{3}$ qt. $=1\frac{5}{9}$ qt;

3 pk. $4\frac{4}{5}$ qt. $+1\frac{5}{9}$ qt. $=3$ pk. $6\frac{16}{45}$ qt.;

5 bu. $3\frac{31}{45}$ qt. — 3 pk. $6\frac{16}{45}$ qt.

$=4$ bu. $5\frac{1}{3}$ qt. $=16\frac{2}{3}$ pk., *Ans.*

	sq. mi.	A.	P.	sq. yd.
Ex. 37.	5	250	120	0
				7
8)	37	475	40	
	4	459	65	
	2	204	118	$5\frac{5}{8}$
	2	254	106	$24\frac{5}{8}$, *Ans.*

mi.	A.	R.	P.	sq. yd.
	456	3	14	25
				$3\frac{1}{4}$
2	90	2	4	$14\frac{1}{2}$
	114	6	33	$21\frac{3}{8}$
2	204	2	38	$5\frac{5}{8}$

Ex. 38. $14.2878\times5.6=80.01168$ lb.
$=80$ lb. 2 pwt. 19.2768 gr., *Ans.*

Ex. 39. $\frac{5}{8}$ of $24=15$ carats fine, *An*

Ex. 40. $24-16=8$ carats $=\frac{8}{24}=\frac{1}{3}$ alloy, *Ans.*

Ex. 41. $384\frac{4}{5}$ A. $=384$ A. 128 P.
22 " 60 "
2) 362 A. 68 P. (See Prob. 33, p. 64.)
181 A. 34 P., younger;
203 " 94 " elder.

Ex. 42. 4000 bu. $\times\frac{52}{58}=3586\frac{6}{29}$ bu., *Ans.*

Ex. 43. 110 bu. $\times 64=7040$ lb. clover seed exchanged;
7040 lb. $\div 60=117\frac{1}{3}$ bu. clover seed, N. Y. measure;
$117\frac{1}{3}\times\frac{4}{1}\times\frac{3}{2}=704$ bu. corn received, N. Y. measure;
$704\times\frac{58}{1}\times\frac{1}{56}=729\frac{1}{7}$ bu. corn, N. J. measure;

\$$\frac{2}{3}$×729$\frac{1}{7}$=\$486$\frac{2}{21}$, corn brought in N. J.;
\$4×110 =\$440, clover seed worth in N. J.;

\$ 46$\frac{2}{21}$, the N. J. farmer gained;
110×$\frac{4}{1}$×$\frac{3}{2}$=660 bu. corn, he would have received had the standards of measure been the same;
hence 729$\frac{1}{7}$ bu.—660 bu.=69$\frac{1}{7}$ bu. corn, gained by the N. J. farmer in the reckoning.

Ex. 44 763.4×763.4=582779.56 sq. ft.
=13 A. 60 P. 164.56 sq. ft., *Ans.*

Ex. 45. 20$\frac{1}{2}$ ft.×2=41 ft., width of both sides;
42×41=1722 sq. ft.=17.22 squares;
\$4.62$\frac{1}{2}$×17.22=\$79.64$\frac{1}{4}$, *Ans.*

Ex. 46. 17 T. 15 cwt. 62$\frac{1}{2}$ lb.=17.78125 T.;
\$1333.593÷17.78125=\$75, nearly, *Ans.*

Ex. 47.

$$\begin{array}{r|l} & 4\\ 4 & 15\\ 3 & 5\\ 231 & 1728\\ \hline 77 & 14400 \end{array}$$

187$\frac{1}{77}$ gal., *Ans.*

Ex. 48.

$$\begin{array}{r|l} & 300\\ 96 & 112\\ \hline \end{array}$$

\$350, *Ans*

Ex. 49.

$$\begin{array}{r|l} & 300\\ 72 & 112\\ \hline 3 & 1400 \end{array}$$

\$466 66$\frac{2}{3}$, *Ans.*

Ex. 50.

$$\begin{array}{r|l} & 300\\ 90 & 112\\ \hline 3 & 1120 \end{array}$$

\$373.33$\frac{1}{3}$, *Ans*

Ex 51

$$\begin{array}{r|l} & 300\\ 56 & 112\\ \hline \end{array}$$

\$600, *Ans.*

Ex. 52.

$$\begin{array}{r|l} & 300\\ 60 & 112\\ \hline \end{array}$$

\$560, *Ans*

(224, 225)

Ex. 53. $\frac{13}{2}\times\$\frac{64}{72}=\$5.777$
$\frac{12}{1}\times\frac{45}{72}=7.50$
$\frac{33}{4}\times\frac{19}{72}=2.177$
$\frac{9}{1}\times\frac{9}{72}=1.125$
$\frac{9}{2}\times\frac{17}{72}=1.0625$
$\frac{27}{4}\times\frac{44}{72}=4.125$

$21.76+, *Ans.*

Ex. 54. (22×130)÷110=26, *Ans.*

Ex. 55. $1000\times\frac{1}{1728}\times\frac{231}{1}=133\frac{49}{72}$ oz.=8 lb. $5\frac{49}{72}$ oz., *Ans.*

Ex. 56. $\frac{45\times44\times144}{4\times5\times500}=\frac{14256}{500}=28\frac{64}{125}$, *Ans.*

Ex. 57. $\frac{9}{2}\times\frac{9}{2}\times\frac{6}{1}\times\frac{1728}{1}\times\frac{1}{231}\times\frac{1}{63}$
$=\frac{7776}{539}=14\frac{230}{539}$ hhd., *Ans.*

Ex. 58. 18 ft. 9 in.=225 in.; 225 in.×3=675 in. per sec;
$\frac{150\times63360}{675}=14080$ sec.=3 h. 54 min. 40 sec., *Ans.*

Ex. 59. He had come from the East, because his watch showed later time;
and 1 h. 6 min. 52 sec.×15=16° 43′, *Ans.*

Ex. 60. $\frac{17}{2}\times\frac{17}{4}\times\frac{15}{4}\times\frac{1728}{1}\times\frac{10}{21504}$
$=\frac{1950975}{17922}=108\frac{15399}{17922}$ bu., *Ans.*

Ex. 61. 3 hhd. 9 gal. 3 qt.=198.75 wine gal.;
198.75×231=45911.25 cu. in.;
45911.25÷277.274=165.5807+Imperial gal., *Ans*

Ex. 62. 105.85 ch.×40.15 ch.=4249.8775 sq. ch.
=424.98775 A., *Ans.*

Ex. 63. Since A has $\frac{7}{12}$ of the farm, B must own $\frac{5}{12}$; and $\frac{7}{12}-\frac{5}{12}=\frac{1}{6}$, the difference between their shares, which is 15 A. $68\frac{1}{2}$ P. Hence 15 A. $68\frac{1}{2}$ P.×6=92 A. 91 P., whole farm; 92 A. 91 P.÷12=7 A. $114\frac{1}{4}$ P., $\frac{1}{12}$ of farm; 7 A. $114\frac{1}{4}$ P.×5=38 A. $91\frac{1}{4}$ P., B's share, *Ans.*

(225, 226)

Ex. 64. $41\times40\times\frac{1}{100}=16.40$ squares in both sides; $\$3.40\times16.40=\$55.76$, *Ans.*

Ex. 65. $189.5\times150=28425$ sq. rd. $=177.65625$ A.; $\$31.75\times177.65625=\$5640.58+$, *Ans.*

Ex. 66. 9.75 tons $\times50=487.5$ cu. ft.; and since every cubic foot will make 12 square feet of inch stuff, 487.5 cu. ft. $\times12=5850$ sq. ft. boards, *Ans.*

Ex. 67. $\frac{4}{1}\times\frac{7}{2}\times\frac{20}{7}\times\frac{1728}{1}\times\frac{1}{231}=\frac{23040}{77}=299\frac{17}{77}$ gal., *Ans.*

Ex. 68. $\frac{128}{1}\times\frac{1}{12}\times\frac{2}{7}=\frac{64}{21}=3\frac{1}{21}$ ft., *Ans.*

Ex. 69. $\frac{32}{1}\times\frac{18}{1}\times\frac{25}{2}\times\frac{1}{60}\times\frac{1}{10}=12$ min , *Ans.*

Ex. 70. Since the lots are to be *square*, the side of one must be a common measure of the two dimensions of the land. The greatest common divisor of $201\frac{2}{3}$ rods and $41\frac{1}{4}$ rods is $\frac{55}{12}$ rods, which is the length of one side of the required lots. Now, if we divide the piece of land, by running lines both crosswise and lengthwise, at a distance asunder of $\frac{55}{12}$ rods, we shall have $41\frac{1}{4}\div\frac{55}{12}=9$ ranges of lots, and $201\frac{2}{3}\div\frac{55}{12}=44$ lots in each range. Hence $44\times9=396$ lots, *Ans.*

Ex. 71. The quantity of land in each of the equal lots must be the greatest common divisor of the quantities in the several pieces. Hence,

4 A. 140 P.= 780 P.	4	780 ..	1092 ..	1560 ..	1872
6 " 132 " =1092 "	3	195 ..	273 ..	390 ..	468
9 " 120 " =1560 "	13	65 ..	91 ..	130 ..	156
11 " 112 " =1872 "		5 ..	7 ..	10 ..	12

$4\times3\times13=156$ P., *Ans.*

DUODECIMALS

ADDITION AND SUBTRACTION

(**388**, page 227.)

Ex. 4.

50 sq. yd.	1 sq. ft.	7′	4″		
62 "	0 "	5′	3″		
48 "	2				
42 "	2 "	3′	4″		
202 sq. yd.	6 sq. ft.	3′	11″	, area of the walls;	
300 sq. yd.	2 sq. ft.	5′		, whole area;	
97 sq. yd.	5 sq. ft.	1′	1″	, *Ans.*	

MULTIPLICATION.

(**390**, page 228.)

Ex. 1

18 ft.	5′
16 ft.	8′
12	3′ 4″
294	8′
306 sq. ft.	11′ 4″, *Ans.*

Ex. 2.

23 ft.	7′
3 "	8′
15	8′ 8″
70	9′
86 sq. ft.	5′ 8″
4 ft.	
345 cu. ft.	10′ 8″=

2 Cd. 5 cd. ft. 9 cu. ft. 10′ 8″, *Ans*

Ex. 3

	79 ft.		8′
	38 “		11′
8 sq. yd.	1 sq. ft.	0′	4″
336 “	3		4′
344 sq. yd.	4 sq. ft.	4′	4″, *Ans.*

Ex. 4.

7 ft.	6′	
3 “	3′	
1 sq. ft.	10′	6″
22 “	6′	
24 sq. ft.	4′	6″
1 ft.	10′	
20 cu. ft.	3′	9″
24 “	4′	6″
44 cu. ft.	8′	3″, *Ans.*

Ex. 5. 56 ft.×7=392 ft., entire length; 392 ft.×11′×10 =43120″=299 cu. ft. 5′ 4″, *Ans.*

Ex. 6.

60 ft.	6′	
40 “	3′	
100 ft.	9′	
	2	
201 ft.	6′	
22 “		
4433 sq. ft.,		in walls;
2924 “	2′	“ roof;
523 “	3′	“ gables;
7880 sq. ft.	5′, *Ans.*	

24 ft.	2′
	2
48 ft.	4′
60 “	6′
24 ft.	2′
2895 “	
2924 sq. ft.	2′

CONTRACTED METHOD.

(**391**, page 229.)

Ex. 1.

7 ft. 3′ 4″ 5‴
6″ 8′ 5ft.

36 5′
4 10′
4′

41 ft. 7′±, *Ans.*

Ex. 2.

36 ft. 9′ 4″
9″ 6″ 26 ft.

106 sq. yd. 2 ft. 3′
2 " 0 " 5′
2 " 3′

Ans. 108 sq. yd. 4 ft. 11′±

Ex. 3.

6 ft. 2′ 7″
4″ 3′ 3 ft.

18 8′
1 7′
2′

20 ft. 5′±
6″ 8′ 2 ft.

40 10′
13 7′
10′

55 cu. ft. 3′±, *Ans.*

Ex. 4.

7 ft. 6′ 8″
11″ 2′ 3 ft.

22 8′
1 3′
7′

24 ft. 6′±
4″ 8′ 3 ft.

73 6′
16 4′
8′

90 ft. 6′± *Ans*

DIVISION.

(392, page 230.)

Ex. 1. 17 ft.)287 ft. 7'(16 ft. 11', *Ans.*
17
117
102
15 ft. 7'
15 " 7'

Ex. 2. 6 ft. 8')29 ft. 5' 4''(4 ft. 5', *Ans.*
26 " 8'
2 ft. 9' 4''
2 " 9' 4''

Ex. 3. 48 ft. 6')1176 ft. 1' 6'' (24 ft. 3', *Ans.*
1164 "
12 ft. 1' 6''
12 " 1' 6''

Ex. 4.
38 ft. 10'
9 ft. 4'
12 11'' 4''
349 6'
362 ft. 5' 4''

362 ft. 5' 4'')275 cu. yd. 5 cu. ft. 1' 4''=
362 ft. 5 4'')7430 cu. ft. 1' 4''(20 ft. 6', *Ans.*
7248 cu. ft. 10' 8''
181 cu. ft. 2' 8'
181 cu. ft. 2' 8''

(230, 231)

CONTRACTED METHOD.

(**393**, page 231.)

Ex. 1.

$$\begin{array}{lrrrl}
2\text{ ft. }10'\,7'')\, & 7\text{ ft.} & 7' & 8'' & (2\text{ ft. }7'\,8''\pm,\ \textit{Ans.}\\
 & 5\ \text{“} & 9' & 2'' & \\ \cline{2-4}
 & 1\text{ ft.} & 10' & 1'' & \\
 & 1\text{ ft.} & 8' & 2'' & \\ \cline{2-4}
 & & 1' & 11'' & \\
 & & 1' & 11'' &
\end{array}$$

Ex. 2.

$$\begin{array}{r}
7\text{ ft. }2'\,4''\\
8'''\,9''\,7'\,4\text{ ft.}\\ \hline
28\ \ 9'\,4''\\
4\ \ 2'\,4''\\
5'\,5''\\
5''\\ \hline
33\text{ ft. }5'\,6''\pm
\end{array}
\qquad
\begin{array}{lrl}
33\text{ ft. }5'\,6'')\, & 64\text{ ft. }9'\,8'' & (1\text{ ft. }11'\,3''\pm,\ \textit{Ans.}\\
 & 33\ \text{“}\ 5'\,6'' & \\ \cline{2-2}
 & 31\text{ ft. }4'\,2'' & \\
 & 30\ \text{“}\ 8'\,1'' & \\ \cline{2-2}
 & 8'\,1'' & \\
 & 8'\,4'' & \\ \cline{2-2}
\end{array}$$

Ex. 3.

$$\begin{array}{lrl}
7\text{ ft. }2'\,11'')\, & 36\text{ ft. }4'\,8'' & (5\text{ ft. }3''\,7'''\pm,\ \textit{Ans.}\\
 & 36\text{ ft. }2'\,7'' & \\ \cline{2-2}
 & 2'\,1'' & \\
 & 1'\,9'' & \\ \cline{2-2}
 & 4'' & \\
 & 4'' & \\ \cline{2-2}
\end{array}$$

SHORT METHODS.

FOR SUBTRACTION.

(395, page 232.)

Ex. 1. 1000
756
244, *Ans*

Ex. 2 4000000
8576
3991424, *Ans*

Ex. 3. 10.0000
.5768
9.4232, *Ans.*

Ex. 4. 1700000
13057
1686943, *Ans*

Ex. 5. 64000.00000
90.59876
63909.40124, *Ans.*

Ex. 6. 1000000
599948
400052, *Ans*

Ex. 7. 1000 100000 10000000
271 18365 3401250
729; 81635; 6598750, *Ans.*

FOR MULTIPLICATION.

(396, page 233.)

Ex. 1. 78400
784
77616, *Ans.*

Ex. 2. 5873.000
5873
5867.127, *Ans*

Ex. 3. 478300000
4783
478295217, *Ans.*

Ex. 4. 75000.000
75
74999.925, *Ans*

(**397**, page 233.)

Ex. 1. 78600
1572
77028, *Ans.*

Ex. 2. 432700
17308
415392, *Ans*

Ex. 3. 7828000
21984
7806016, *Ans.*

Ex. 4. 7873586000
39367930
78342.18070, *Ans*

Ex. 5. 437890000
262734
437627266, *Ans.*

Ex. 6. 7077364000000
49541548
7077314.458452, *Ans*

(**398**, page 234.)

Ex. 1. 567×13
7371, *Ans.*

Ex. 2. 439603×10.5
4615831.5, *Ans.*

Ex. 3. 7859×107
840913, *Ans.*

Ex. 4. 18075×1008
18219600, *Ans.*

Ex. 5. 3907×10.002
39077.814, *Ans.*

(**399**, page 235.)

Ex. 1. 56783×71
4031593, *Ans.*

Ex. 2. 47.89×60.1
2878.189, *Ans.*

Ex. 3. 3724.5×.901
3355.7745, *Ans.*

Ex. 4. 103078×40001
4123223078, *Ans*

(**400**, page 236.)

Ex. 1.
432711000
432711
9)432278289
48030921
2
96061842, *Ans.*

Ex. 2.
5780000
578
9)5779422
642158, *Ans.*

Ex. 3.
673200000
6732
9)673193268
74799252
8
59.8394016, *Ans.*

Ex. 4.
8675000
8675
9)8666325
962925
7
674047.5, *Ans.*

Ex. 5.
4444400000
44444
9)4444355556
493817284
8
3950538272, *Ans.*

(**401**, page 237.)

Ex. 1. $24\times30+3^2=729$, *Ans.*

Ex. 2. $48\times50+1^2=2401$, *Ans.*

Ex. 3.

$28^2=26\times30+2^2=784$ $26^2=22\times30+4^2=676$
$39^2=38\times40+1^2=1521$ $38^2=36\times40+2^2=1444$
$37^2=34\times40+3^2=1369$ $36^2=32\times40+4^2=1296$
$35^2=30\times40+5^2=1225.$

Ex. 4.

$77^2=74\times80+3^2=5929$; $88^2=86\times90+2^2=7744$;
$8.6^2=8.2\times9.0+.4^2=73.96$;
$99^2=98\times100+1^2=9801$; $98^2=96\times100+2^2=9604$;
$69^2=68\times\ 70+1^2=4761$; $68^2=66\times\ 70+2^2=4624$;
$6.7^2=6.4\times7.0+.3^2=44.89$; $62^2=60\times\ 64+2^2=3844$.

(**403**, page 237.)

Ex. 1. 43700÷4=10925, *Ans.*
Ex. 2. 68720÷4=17180, *Ans.*
Ex. 3. 5734154000÷3=$1911384666\frac{2}{3}$, *Ans.*
Ex. 4. 75864200÷8=9483025, *Ans.*
Ex. 5. 78563000÷8=9820375, *Ans.*
Ex. 6. 57687000÷7=8241000, *Ans.*

(**404**, page 238.)

Ex. 1. $43789\times100\times8\frac{1}{4}=36125925$, *Ans.*
Ex. 2. $58730\times1000\times7\frac{1}{8}=418451250$, *Ans.*
Ex. 3. $7854\times34\frac{1}{4}=268999.5$, *Ans.*
Ex. 4. $30724\times10000\times7\frac{1}{3}=2253093333\frac{1}{3}$, *Ans.*
Ex. 5. $47836\times100\times7\frac{1}{8}=34083150$, *Ans.*
Ex. 6. $53727\times100\times24\frac{1}{6}=129840250$, *Ans.*

(**405**, page 239.)

Ex. 1. $568÷4=$142, *Ans.*

Ex. 2. $51÷6=$8.50; 33×8=264 yd.; $264÷16=$16.50; $18÷3=$6; $8.50+$16.50=$25;
$25—$6=$19. *Ans.*

Ex. 3. $28÷8=$3.50, *Ans.*
Ex. 4. $576÷9=$64, *Ans.*

Ex. 5. $7.875÷63=$.125=$$\frac{1}{8}$, gain on 1 gal.;
$576÷8=$72, *Ans.*

(**406**, page 241.)

Ex. 2. $15.46
46

$711.16, cost of 3 lb. 10 oz.=46 oz.;
.773 " " 1 pwt.=$\frac{1}{20}$ of 1 oz.;
5.411 " " 7 "
.129 " " 4 gr.=$\frac{1}{6}$ of 1 pwt.;
.032 " " 1 "
.016 " " $\frac{1}{2}$ "

$717.521, *Ans.*

Ex. 3. 90 lb.=.9 cwt.; $.56×5.9=$3.304, *Ans.*

Ex. 4. $4.48
3

$13.44, cost of 3 bu.;
1.12 " " 1 pk.=$\frac{1}{4}$ bu.;
.14 " " 1 qt.=$\frac{1}{8}$ pk.;
28 " " 2 "

$14.98, *Ans.*

Ex. 5. 8 lb. 5.42 oz.
5

41 lb. 11.1 oz., weight of 5 gal.;
2 " 1.355 " " " 1 qt.=$\frac{1}{4}$ gal.
4 " 2.71 " " " 2 "
1 " 0.6775 " " " 1 pt.=$\frac{1}{2}$ qt.
4.1693$\frac{3}{4}$ " " " 1 gi.=$\frac{1}{4}$ pt.
8.3387$\frac{1}{2}$ " " " 2 "

49 lb. 12.3506$\frac{1}{4}$ oz.

Ex. 6. $17.50
3

$52.50 , cost of 3 A.;
4.375, " " 1 R.;
.547, " " 5 P.=$\frac{1}{8}$ R.;
3.282, " " 30 P.;
.043, " " .4 P.=$\frac{1}{100}$ R.;

$60.747—, *Ans.*

Ex. 7 £3 17 s. 10.5 d.
7

£27 5 s. 1.5 d., val. of 7 oz.;
1 18 " 11.25 " " " 10 pwt=$\frac{1}{2}$ oz.;
19 " 5.625 " " " 5 "
3 " 10.725 " " " 1 "
1 " 11.3625 " " " 12 gr.=$\frac{1}{2}$ pwt.;
11.68125 " " " 6 " =$\frac{1}{2}$ of 12 gr.;

£30 10 s. 4.14375 d., *Ans.*

Ex. 8 4° 36′ 40″
5

23° 3′ 20″, in 5 da.;
2° 18′ 20″, " 12 h.=$\frac{1}{2}$ da.;
34′ 35″, " 8 "
5′ $45\frac{5}{6}$″, " 30 min.=$\frac{1}{8}$ of 3 h.;
$23\frac{1}{18}$″, " 2 "
$5\frac{55}{72}$″, " 30 sec.=$\frac{1}{4}$ of 2 min.
$2\frac{127}{144}$″, " 15 "
$1\frac{199}{216}$″, " 10 "

26° 2′ $34\frac{197}{432}$″, *Ans.*

Ex. 9. 7 gal. 1 qt. 1 pt. 3 gi.=7.46875 gal.;
hence, $7.46875, cost at 8 s.;
$3.734375, " " 4 s.;
.622395+, " " 8 d.;
$4.35+, *Ans.*

Ex 10. $12.50 , at 6 s. per day;
$ 2.083+, " 1 s " "
$10.416+, " 5 s. " "
.521—, " 3 d. " "
$10.93+, *Ans.*

FOR DIVISION.

(407, page 242.)

Ex. 1 634.75×4=2539, *Ans.*
Ex. 2. 785.6×8=6284.8, *Ans.*
Ex. 3. 5.16×3=15.48, *Ans.*
Ex. 4. .167324×8=1.338592, *Ans.*
Ex. 5. 1748×7=12236, *Ans.*
Ex. 6. 57.634×6=345.804, *Ans.*

(408, page 243.)

Ex. 1. 2575) 64375
4 4
103/00) 2575/00(25, *Ans.*
206
515
515

Ex. 2. 3625) 76394
8 8

29/000) 611/152 ($21\frac{269}{3625}$, *Ans.*
58

81
29

2152÷8=269

Ex. 3. $433\frac{1}{3}$) 7325
3 3

13/00) 219/75 ($16\frac{47}{52}$, *Ans.*
13

89
78

1175×4=47/00
1300×4=52/00

Ex. 4. 431.25) 5736
8 8

3450 45888
2 2

69/00) 917/76 ($13\frac{173}{575}$. *Ans.*
69

227
207

2076÷12=173

(243)

Ex. 5. $566\frac{2}{3}$) 42.75
3 3

17/00) 128/.25 (.07$\frac{37}{68}$, *Ans.*
119

9.25×4=37
17.00×4=68

Ex 6. .21875) 24409375
8 8

1.75 195275000
4 4

7)781100000

111585714$\frac{2}{7}$, *Ans.*

Ex. 7. 3.14$\frac{2}{7}$) 785
7 7

22 4095

249$\frac{17}{22}$, *Ans.*

RATIO.

(**421**, page 246.)

Ex. 2. $\frac{6}{42}=\frac{1}{7}$, *Ans.*

Ex. 3. $\frac{80}{120}=\frac{2}{3}$, *Ans.*

Ex. 4. $\dfrac{60}{8\frac{4}{7}}=7$, *Ans.*

Ex. 5. $\frac{26}{1}\times\frac{13}{7}=48\frac{2}{7}$, *Ans*

Ex. 6. $2\frac{1}{2}\div7\frac{1}{8}=\frac{5}{2}\times\frac{8}{57}=\frac{20}{57}$, *Ans.*

Ex. 7 $\frac{7}{10}\div\frac{1}{6}=\frac{7}{10}\times\frac{6}{1}=4\frac{1}{5}$, *Ans.*

Ex. 8. 1 mi.=320 rd.; $\frac{3}{8}$, *Ans.*

Ex. 9. 1 wk. 3 da. 12 h. = 252 h.; 9 wk. = 1512 h.;
$1512 \div 252 = 6$, *Ans.*

Ex. 10. 10 A. 60 P. = 1660 P.;
6 A. 110 P. = 1070 P.;
$1070 \div 1660 = \frac{107}{166}$, *Ans.*

Ex. 11. 25 bu. 2 pk. 6 qt. = 822 qt.;
40 bu. 4.5 pk. = 1316 qt.; $1316 \div 822 = 1\frac{247}{411}$, *Ans*

Ex. 12. $18\frac{3}{4}° = 67500''$; $45' \, 30'' = 2730''$;
$\frac{2730}{67500} = \frac{91}{2250}$, *Ans.*

Ex. 13. $\dfrac{\frac{2}{3} \times \frac{3}{4}}{\frac{1}{2}} \div \dfrac{12\frac{1}{2}}{\frac{4}{7}} = \frac{2}{3} \times \frac{3}{4} \times \frac{2}{1} \times \frac{4}{7} \times \frac{2}{25} = \frac{8}{175}$, *Ans.*

Ex. 14. $\frac{5}{8} \times \frac{3}{10} \times \frac{39}{4} \times \frac{1}{13} \times \frac{71}{8} \times \frac{2}{25} = \frac{639}{6400}$, *Ans.*

Ex. 15. $42 \div 28 = 1\frac{1}{2}$, *Ans.* (See **415.**)

Ex. 16. 43 gal. = 172 qt.; $\frac{3}{172}$, *Ans.*

Ex. 17. $15 \times \frac{4}{5} = 12$, *Ans.*

Ex. 18. $3\frac{1}{4} \div 7 = \frac{13}{28}$, *Ans.*

Ex. 19. $.75 \div (\frac{1}{2} \times \frac{5}{8}) = \frac{75}{100} \times \frac{2}{1} \times \frac{8}{5} = 2\frac{2}{5}$, *Ans.*

Ex. 20. $6.125 ÷ 25 = $.245, *Ans.*

Ex. 21. $\frac{3}{5} \times \frac{1}{6} = \frac{1}{10}$, *Ans.*

Ex. 22. 13 A 145 P. × $\frac{42}{89}$ = 6 A. 90 P., *Ans.*

PROPORTION.

(**428**, page 248.)

Ex. 1. $(?) = \dfrac{26 \times 10}{4} = 65$, *Ans.*

Ex. 2. $(?) = \dfrac{16 \text{ A.} \times 8865}{720} = 197 \text{ A.}$, *Ans*

Ex. 3. $(?)=\dfrac{4\frac{1}{2}\text{ yd.}\times 29.25}{9.75}=13\frac{1}{2}$ yd., *Ans.*

Ex. 4. 21 A. 140 P. = 3500 P.;

$(?)=\dfrac{3500\text{ P.}\times 1260}{750}=5880$ P. = 36 A. 120 P., *Ans.*

Ex. 5 $(?)=\frac{106}{15}$ oz. $\times\frac{7.50}{1}\times\frac{1}{18}=2\frac{17}{18}$ oz., *Ans.*

Ex. 6. £407 2s. $10\frac{2}{7}$d. = £$407\frac{1}{7}$ = £$\frac{2850}{7}$;

$(?)=7$ oz. $\times\frac{2850}{7}\times\frac{1}{30}=95$ oz. = 7 lb. 11 oz., *Ans*

Ex. 7. $(?)=\dfrac{.15\text{ hhd.}\times 2.39}{.3585}=1$ hhd., *Ans.*

Ex. 8. 1 T. 7 cwt. 3 qr. 20 lb. = 3128 lb.;

13 T. 5 cwt. 2 qr. = 29736 lb.;

$(?)=\$\frac{9.50\times 29736}{3128}=\$70\frac{905}{1564}$, *Ans.*

Ex. 9. $(?)=\$175.35\times\frac{3}{7}\times\frac{8}{1}=\$601.20$, *Ans.*

Ex. 10. $\$12\frac{1}{2}=\$\frac{25}{2}$; $240\frac{1}{7}=\frac{1681}{7}$; $149\frac{177}{1127}=\frac{168100}{1127}$;

$(?)=\$\frac{25}{2}\times\frac{1681}{7}\times\frac{1127}{168100}=\$20\frac{1}{8}$, *Ans.*

Ex. 11. $\frac{3}{5}$ yd. $\times\frac{590625}{10000}\times\frac{8}{7}=40\frac{1}{2}$ yd., *Ans.*

SIMPLE PROPORTION.

(**436**, page 252.)

Ex. 1. 12 gal.: 63 gal. = \$30 : (?)

$(?)=\$\frac{30\times 63}{12}=\$157.50$, *Ans.*

Ex. 2. 9 bu.: 100 bu. = 2 bar.: (?)

$(?)=\dfrac{2\text{ bar.}\times 100}{9}=22\frac{2}{9}$ bar., *Ans.*

Ex. 3. $\$26.75-\$22.25=\$4.50$, gain on 18 bu.;
18 bu. : 240 bu.$=\$4.50$: (?)
(?)$=\$\frac{4.50\times240}{18}=\$60$, *Ans.*

Ex. 4. $6\frac{1}{2}$ bu. : $9\frac{1}{4}=\$3$: (?)
(?)$=\$3\times\frac{37}{4}+\frac{2}{13}=\$4.269+$, *Ans.*

Ex. 5. $1\frac{3}{4}$ yd. : $87\frac{1}{2}$ yd.$=\$.42$: (?)
(?)$=\$.42\times\frac{175}{2}\times\frac{4}{7}=\$21$, *Ans.*

Ex. 6. $\$1500\times\frac{1000}{275.40}=\$5446.62+$, *Ans.*

Ex. 7. $\frac{4}{5}$ of 15 da.$=12$ da.; and since the number of men required will vary inversely as the time, 20 men $\times\frac{15}{12}=25$ men required to perform the work in 12 days; 25 men—20 men$=5$ men to be added.

Ex. 8. 100 yd. : 3.25 yd.$=\$473.07\frac{9}{13}$: (?)
$\$\frac{6150}{13}\times\frac{13}{4}\times\frac{1}{100}=\$15.375$, *Ans.*

Ex. 9. 1 lb. 4 oz. 10 pwt.$=330$ pwt.;
330 pwt. : (?)$=\$260.70$: $\$39.50$

$$(?)=\frac{330\text{ pwt.}\times260.70}{39.50}=2\text{ oz. }10\text{ pwt., } \textit{Ans.}$$

Ex. 10. 1 h. 14 min.$\times\frac{54}{24}=2$ h. 46 min. 30 sec., *Ans.*

Ex. 11 $\$\frac{12}{25}$: $\$\frac{7}{20}=\frac{4}{5}$ bu. : (?);
(?)$=\frac{4}{5}$ bu.$\times\frac{7}{20}\times\frac{25}{12}=\frac{7}{12}$ bu., *Ans.*

Ex. 12. 46 A. 134 P.$=7494$ P.; 35 A. 90 P.
$=5690$ P.; $\$374.70\times\frac{5690}{7494}=\$284.50$, *Ans.*

Ex. 13. 1 yr. 3 mo.$=15$ mo.; 2 yr. 8 mo.$=32$ mo.;
$\$1870.65\times\frac{32}{15}=\$3990.72$, *Ans.*

Ex. 14. $164.5\times\frac{7\frac{1}{2}}{5}=246.75$, *Ans.*

Ex. 15. 12 A. 156 P.$=2076$ P.;
2076 P.$\times\frac{132}{16}\times17127$ P.$=107$ A. 7 P., *Ans.*

(252, 253)

Ex. 16. \$325 : \$2275 = \$26.32 : (?);

$$(?)=\frac{\$26.32\times2275}{325}=\$184.24,\ \textit{Ans.}$$

Ex. 17 $60.5\times44=2662$ sq. ft. $=295\frac{7}{9}$ sq. yd.;
$14\frac{1}{4}$ sq. yd. : $295\frac{7}{9}$ sq. yd. $=\$34\frac{1}{5}$: (?);
$(?)=\$\frac{171}{5}\times\frac{2662}{9}\times\frac{4}{57}=\$709.86\frac{2}{3}$, *Ans.*

Ex. 18. 1 doz. = 12; $10\frac{3}{4}$ gross = 1548;
$\$.0625\times\frac{1548}{12}=\$8.06\frac{1}{4}$, *Ans.*

Ex. 19. 7 s. 6 d. $=7\frac{1}{2}$s. $=\frac{15}{2}$ s.; and since the weight of the loaf should vary inversely as the price of wheat, we have $7\frac{1}{2}$ s. : 6 s. :=(?) : 9 oz.;
$(?)=9$ oz. $\times\frac{15}{2}\times\frac{1}{6}=11\frac{1}{4}$ oz., *Ans.*

COMPOUND PROPORTION.

(**439**, page 256.)

Ex. 1. $\begin{cases}12\\5\end{cases} : \begin{cases}(?)\\18\end{cases} = 11 : 33$

$$\begin{array}{r|l}(?)&12\\18&5\\11&33\end{array}$$

$(?)=10$, *Ans*

Ex. 2. 40 da. $\times\frac{300}{480}\times\frac{24}{48}=12\frac{1}{2}$ da., *Ans.*

Ex. 3.

$\begin{cases}7\\12\end{cases}\ \begin{cases}16\\(?)\end{cases} = 1260 : 4728$

$$\begin{array}{r|l}16&7\\(?)&12\\1260&4728\\\hline 10&197\end{array}$$

$(?)=19.7$ da., *Ans*

Ex. 4.
$$\left\{\begin{array}{r}144\\6\\12\end{array}\right. : \left\{\begin{array}{l}30\\(?)\\7\end{array}\right. = \left\{\begin{array}{l}200\\3\\2\end{array}\right. : \left\{\begin{array}{l}350\\6\\3\end{array}\right.$$

$$(?)=\frac{144\times6\times12\times350\times6\times3}{30\times7\times200\times3\times2}=259.2 \text{ da., } \textit{Ans.}$$

Ex. 5. 5 bu.$=$20 pk.; 3 bu. 3 pk.$=$15 pk.;
22 da.$\times\frac{9}{6}\times\frac{20}{15}=$44 da., *Ans.*

Ex. 6.
$$\left\{\begin{array}{r}(?)\\10\frac{2}{3}\\1\frac{1}{2}\end{array}\right. : \left\{\begin{array}{r}3000\\12\frac{2}{3}\\2\frac{3}{4}\end{array}\right. =1:1 \qquad \begin{array}{r|l}(?)&3000\\32&3\\3&38\\3&2\\4&11\end{array}$$

$(?)=6531\frac{1}{4}$, *Ans.*

Ex. 7.
$$\left\{\begin{array}{l}300\\1.25\end{array}\right. : \left\{\begin{array}{l}(?)\\.90\end{array}\right. = 1:3 \qquad \begin{array}{r|l}(?)&300\\.90&1.25\\1&3\end{array}$$

$(?)=1250$ bu., *Ans.*

Ex. 8.
$$468 : (?) = \left\{\begin{array}{l}26\\4\end{array}\right. : \left\{\begin{array}{l}120\\6\end{array}\right.$$

$$(?)=\frac{468\times120\times6}{26\times4}=3240, \textit{ Ans.}$$

Ex. 9.
$$\left\{\begin{array}{l}17\frac{1}{2}\\10\frac{1}{2}\\13\end{array}\right. : \left\{\begin{array}{l}16\\7\\15\end{array}\right. =546:(?)$$

$(?)=\frac{16}{1}\times\frac{7}{1}\times\frac{15}{1}\times\frac{546}{1}$ bbl.
$\times\frac{2}{35}\times\frac{2}{21}\times\frac{1}{13}=384$ bbl., *Ans.*

Ex. 10. 7 da.$\times\frac{11}{5}\times\frac{150}{147}\times\frac{14}{10}=22$ da., *Ans.*

(256)

PROMISCUOUS EXAMPLES IN PROPORTION.

(Page 257.)

Ex 1. 7 ft. : 198 ft.=4 ft. : (?)

$$(?)=\frac{4\text{ ft.}\times198}{7}=113\tfrac{1}{7}\text{ ft., } \textit{Ans.}$$

Ex. 2. \$972 : \$11⅓=\$607½ : (?)

$(?)=\frac{34}{3}\times\frac{1215}{2}\times\frac{1}{972}=\$7.08+$, *Ans.*

Ex. 3. 3 cwt.$\times\frac{660}{60}\times\frac{12}{4}=99$ cwt., *Ans.*

Ex. 4. 18 da.$\times\frac{8}{10}=14\frac{2}{5}$ da., *Ans.*

Ex. 5.

$$\left\{\begin{matrix}(?)\\16.50\end{matrix}\right. : \left\{\begin{matrix}140\\24.75\end{matrix}\right. =1 : 1$$

$$(?)=\frac{140\text{ A.}\times24.75}{16.50}=210\text{ A., } \textit{Ans.}$$

Ex. 6.

$$\left\{\begin{matrix}1728\\18\end{matrix}\right. : \left\{\begin{matrix}750\\54\end{matrix}\right. =\$155.52 : (?)$$

$$(?)=\frac{\$155.52\times750\times54}{1728\times18}=\$202.50\text{, } \textit{Ans.}$$

Ex. 7.

$$28\text{ oz.} : (?)=\left\{\begin{matrix}2\frac{1}{2}\\6\end{matrix}\right. : \left\{\begin{matrix}150\\4\end{matrix}\right.$$

$(?)=28\text{ oz.}\times\frac{150}{1}\times\frac{4}{1}\times\frac{2}{5}\times\frac{1}{6}=1120$ oz.=70 lb., *Ans.*

Ex. 8. 15 men$\times\frac{20}{5}=60$ men, *Ans.*

Ex. 9. 12s. 7d.=151d.; 1 oz.=240 gr.;
15 lb. 11 oz. 13 pwt. 17 gr.=92009 gr.;
240 gr.: 92009 gr.=151d.: (?)

$$(?)=\frac{151\text{d.}\times92009}{240}=28944.497+\text{d.};$$

28944.497d.÷96=\$301.50+, *Ans.*

Ex. 10. $\left\{\begin{array}{r}16\\7\\15\end{array}\right. : \left\{\begin{array}{l}17\frac{1}{2}\\10\frac{1}{2}\\16\end{array}\right.=\$36.72 : (?)$ $\quad\begin{array}{r|l}(?) & \$36.72\\16 & 17.5\\7 & 10.5\\15 & 16\end{array}$

(?)=$64.26, *Ans*

Ex. 11. 2 yr. 5 mo. 5 da.=$29\frac{1}{6}$ mo.; 1 yr. 8 mo.=20 mo.; and since the money lent should vary inversely as the time, we have $29\frac{1}{6}$ mo. : 20 mo.=(?) : $1200;

$$(?)=\frac{\$1200\times29\frac{1}{6}}{20}=\$1750,\ \textit{Ans.}$$

Ex. 12. $9 : $5=$10.50 : $\$5.83\frac{1}{3}$, *Ans.*

Ex. 13. $\left\{\begin{array}{l}12\\9\\15\frac{5}{9}\end{array}\right. : \left\{\begin{array}{l}(?)\\7\\15\end{array}\right.=2 : 1$ $\quad\begin{array}{r|r}(?) & 12\\7 & 9\\15 & \\2 & \\9 & 140\end{array}$

12—8=4 men, *Ans.* (?)=8 men.

Ex. 14. 1 yr. 8 mo.=20 mo.; 3 yr. 4 mo. 24 da.=40.8 mo.;

$$\left\{\begin{array}{l}300\\20\end{array}\right. : \left\{\begin{array}{l}210.25\\40.8\end{array}\right.=\$30 : (?)$$

$$(?)=\frac{\$30\times210.25\times40.8}{300\times20}=\$42.891,\ \textit{Ans.}$$

Ex. 15. $\left\{\begin{array}{l}(?)\\\frac{3}{4}\end{array}\right. : \left\{\begin{array}{l}9\frac{1}{2}\\1\frac{1}{4}\end{array}\right.=1 : 1$ $\quad\begin{array}{r|l}(?) & \\3 & 4\\2 & 19\text{ yd.}\\4 & 5\end{array}$

Or,

$\frac{3}{4}$: $1\frac{1}{4}$=$9\frac{1}{2}$ yd. : (?)

(?)=$\frac{19}{2}$ yd.$\times\frac{5}{4}\times\frac{4}{3}$=$15\frac{5}{6}$ yd, *Ans.* ( )=$15\frac{5}{6}$ rd., *Ans*

Ex 16. $\left\{\begin{array}{l}24\\18\end{array}\right. : \left\{\begin{array}{l}38\\22\end{array}\right.=\$95.60 : (?)$

(?)=$\$95.60\times\frac{38}{24}\times\frac{22}{18}$=$185.00+, *Ans.*

(257, 258

Ex. 17. $16\frac{7}{18}$ Cd. : (?)$=11\frac{9}{26}$ T. : $15\frac{7}{13}$ T.
(?)$=\frac{295}{18}$ Cd.$\times\frac{202}{13}\times\frac{26}{295}=22\frac{4}{9}$ Cd., *Ans.*

Ex. 18. $$\left\{\begin{matrix}8\\4\frac{1}{5}\\2\frac{1}{2}\end{matrix}\right. \;:\; \left\{\begin{matrix}18\\3\frac{5}{6}\\(?)\end{matrix}\right. =75 \;:\; 450$$
(?)$=\frac{5}{2}$ ft.$\times\frac{21}{5}\times\frac{8}{1}\times\frac{450}{1}\times\frac{6}{23}$
$\times\frac{1}{18}\times\frac{1}{75}=7\frac{7}{23}$ ft., *Ans.*

Ex. 19. $$\left\{\begin{matrix}4\\2\frac{1}{2}\\8\frac{1}{4}\end{matrix}\right. \;:\; \left\{\begin{matrix}15\\3\frac{3}{4}\\9\end{matrix}\right. =6\frac{2}{3}\text{ A.} \;:\; (?)$$
(?)$=\frac{20}{3}$ A. $\frac{15}{1}\times\frac{15}{4}\times\frac{9}{1}\times\frac{1}{4}\times\frac{2}{5}\times\frac{4}{33}=40\frac{10}{11}$ A., *Ans*

Ex. 20. $600\times\frac{5}{10}\times\frac{12}{8}=450$ men, *Ans.*

Ex. 21. 120 gal.—80 gal.=40 gal. gained in 1 hour;
20 bar.=630 gal. to be be filled;
40 gal. : 630 gal.=1 h. : $15\frac{3}{4}$ h., *Ans.*

Ex. 22. 16 oz.—$14\frac{9}{16}$ oz.$=1\frac{7}{16}$ oz.$=\frac{23}{16}$ oz. Now, if every 16 ounces of groceries have been lessened $\frac{23}{16}$ ounces, how much should the price, \$38.40, be lessened?
16 oz.: $1\frac{7}{16}$ oz.=\$38.40 : \$3.45, *Ans.*

Another Solution.

If every 16 oz. be reduced to $14\frac{9}{16}$, to what sum should the cost, \$38.40, be reduced?

16 oz. : $14\frac{9}{16}$=\$38.40 : \$34.95
\$38.40—\$34.95=\$3.45, *Ans.*

Ex. 23. 75 lb. coffee$\times\frac{8}{5}$=120 lb. sugar;
5 lb. : 120 lb.=\$.625 : \$15, *Ans.*

Ex. 24. \$28.75$\times\frac{4000}{3250}$=\$35.38+, *Ans.*

Ex. 25. $$\left\{\begin{matrix}12000\\12\\550\end{matrix}\right. \;:\; \left\{\begin{matrix}3000\\8\\320\end{matrix}\right. =859\frac{3}{8} \;:\; (?)$$
(?)$=\frac{6875}{8}\times\frac{3000}{12000}\times\frac{8}{12}\times\frac{320}{550}=83\frac{1}{3}$, *Ans*

Ex. 26. $$\left\{\begin{array}{r}248\\5\frac{1}{2}\\\\12\end{array}\right.\left\{\begin{array}{l}24\\(?)\\\\9\end{array}\right. = \left\{\begin{array}{r}7\\232\frac{1}{2}\\\\3\frac{2}{3}\\2\frac{1}{3}\end{array}\right. : \left\{\begin{array}{r}4\\387\frac{1}{2}\\\\5\frac{1}{4}\\3\frac{1}{2}\end{array}\right.$$

$(?)=\frac{248}{1}\times\frac{11}{2}$ da. $\times\frac{12}{1}\times\frac{4}{1}\times\frac{775}{2}\times\frac{21}{4}\times\frac{7}{2}\times\frac{1}{24}\times\frac{1}{9}\times\frac{1}{7}\times\frac{2}{465}\times\frac{3}{11}\times\frac{3}{7}=155$, *Ans.*

PERCENTAGE.

NOTATION.

(**442**, page 260.)

Ex 1. .03; .09; .12; .16; .23; .37; .75; 1.25; 1.84; 2.05.

Ex. 2. .15; .11; .045; .0525; .0875; .205; .25625; .356; .24875; 1.305.

Ex. 3. .0025; .0075; .005; .004; .00375; .0028; .00288; .013125; .102.

Ex. 4. $\frac{1}{25}$; $\frac{3}{8}$; $\frac{21}{125}$; $\frac{1}{9}$; $\frac{3}{7}$, $\frac{5}{11}$, $\frac{16}{37}$, *Ans.*

Ex. 6. $.065=.06\frac{1}{2}=6\frac{1}{2}$ per cent., *Ans.*

Ex. 7. $.14375=.14\frac{3}{8}=14\frac{3}{8}$ per cent., *Ans.*

Ex. 8. $.0975=.09\frac{3}{4}=9\frac{3}{4}$ per cent., *Ans.*

Ex. 9. $.014=.01\frac{2}{5}=1\frac{2}{5}$ per cent., *Ans.*

Ex. 10. $.1025=.10\frac{1}{4}=10\frac{1}{4}$ per cent., *Ans.*

Ex. 11. $.004=.00\frac{2}{5}=\frac{2}{5}$ per cent., *Ans.*

Ex. 12. $.028=.02\frac{4}{5}=2\frac{4}{5}$ per cent., *Ans.*

Ex. 13. $.1324=.13\frac{6}{25}=13\frac{6}{25}$ %, *Ans.*

Ex. 14. $.084\frac{2}{7}=.08\frac{3}{7}=8\frac{3}{7}$ %, *Ans.*

Ex. 15. $.004\frac{6}{11}=.00\frac{5}{11}=\frac{5}{11}$ %, *Ans.*

Ex. 16. $.003\frac{1}{13}=.00\frac{4}{13}=\frac{4}{13}$ %, *Ans.*

GENERAL PROBLEMS IN PERCENTAGE.

(**449**, page 261.)

Ex. 5. *Ans.* 70.65 lb. **Ex. 6.** *Ans.* 240 mi.

Ex. 8. *Ans.* 919 men. **Ex. 9.** 756×1.25=945, *Ans.*

Ex. 12. $\frac{5}{6}\times\frac{3}{400}=\frac{1}{160}$, *Ans.*

Ex. 13. $14\frac{2}{7}\%=\frac{1}{7}$; $\frac{21}{4}\times\frac{1}{7}=\frac{3}{4}$, *Ans.*

Ex. 14. \$375×.05=\$18.75, *Ans.*

Ex. 15. \$536+\$450+\$784=\$1770, debts;
\$1770×.54=\$955.80, *Ans.*

Ex. 16. 15 %+5 %+6 %+8 %=34 %=.34;
\$1500×.34=\$510, *Ans.*

Ex. 17. \$3500×3=\$10500, received in 3 years;
10 %+12 %+18 %=40 %; \$3500×.40=\$1400
spent in 3 years; \$10500—\$1400=\$9100, *Ans.*

Ex. 18. 1.00—.25=.75; .75×.30=.225;
25+.225=.475 drawn;
.475×.10=.0475 deposited again;
1.00—.4275=.5725 in bank;
\$6000×.5725÷\$3435, *Ans.*

Ex. 19 $2\%+3\frac{1}{4}\%+2\%+2\frac{1}{2}\%+1\frac{1}{2}\%+2\frac{3}{4}\%+4\%$
$+3\%=21\%$ entire gain;
$\frac{1}{2}\%+1\frac{3}{4}\%+1\%+\frac{3}{4}\%=4\%$ " loss;
17 % net profits,
\$5400×.17=\$918, *Ans*

(**450**, page 263.)

Ex. 1. \$21.60÷\$720=.03=3 %, *Ans.*

Ex. 2 234÷1560=.15=15 %, *Ans.*

Ex. 3. 49÷980=.05=5 %, *Ans.*

Ex. 4. £320 10 s.=£320.5; £25 12.8 s.=£25.64;
25.64÷320.5=.08=8 %, *Ans.*

Ex. 5 5 gal. 3 qt.=5.75 gal.;
5.75÷46=.125=12½ %, *Ans.*

Ex 6. 5.495÷7.85=.7=70 %, *Ans.*
Ex. 7 $\frac{2}{5}\div\frac{8}{15}=\frac{3}{4}$=.75=75 %, *Ans.*
Ex. 8 $\frac{3}{25}\div\frac{4}{7}=\frac{21}{100}$=.21=21 %, *Ans.*
Ex. 9. 80÷560=$\frac{1}{7}$= 14$\frac{2}{7}$ %, *Ans.*
Ex. 10. 26.01÷578=.045=4½ %, *Ans.*
Ex. 11. $145.836÷$972.24=15 %, *Ans.*
Ex. 12. 448÷5600=8 %, *Ans.*
Ex. 13. 4914÷7560=65 %, *Ans.*
Ex. 14. 455÷2600=17½ %, *Ans.*
Ex. 15. 720 bar.—288 bar.=432 bar. unsold;
432÷720=60 %, *Ans.*

Ex. 16. $\frac{4}{5}\times\frac{30}{100}=\frac{6}{25}$; $\frac{6}{25}\div1=\frac{6}{25}=\frac{24}{100}$=24 %, *Ans.*

Ex. 17. $23,243,822.38
14,712,610.21

$37,956,432.59÷$83,751,511.57
=.4532+=45⅓ % nearly, *Ans.*

Ex. 18. 165×5=825, aggregate number of questions asked
130+125+96+110+160=621, number answered
621÷825=$.75\dot{2}\dot{7}$ =$75.\dot{2}\dot{7}$ %, *Ans.*

(**451**, page 264.)

Ex. 1. 18÷.25=72, *Ans.*
Ex 2. 54÷.15=360, *Ans.*
Ex. 3. 17.5÷.02⅓=750, *Ans*
Ex. 4. 2.28÷.05=45.6, *Ans.*
Ex. 5. 414÷1.20=345, *Ans.*
Ex. 6. 6119÷1.055=5800, *Ans.*

Ex. 7. $.43 \div .71\frac{2}{3} = .6$, *Ans.*

Ex. 8. $\$18.75 \div .025 = \$750$, *Ans.*

Ex. 9. $31\frac{1}{4} \div .31\frac{1}{4} = 100$, *Ans.*

Ex. 10. $\$4578 \div .84 = \$5450$, *Ans.*

Ex. 11. $1.00 - .30 = .70\ \%$, sold; $8150 \div .70 = 4500$, *Ans.*

Ex. 12. $.40 \times .13\frac{1}{3} = .05\frac{1}{3}$ for the carriage;
$\$116 \div .05\frac{1}{3} = \$2175$, *Ans.*

Ex. 13. $\$147.56 \div .13\frac{1}{3} = \$1106.70$, A's;
$\$1106.70 \times .04\frac{2}{3} = \$51.646$;
$\$51.646 \div .08 = \$645.575$, B's;
$\$1106.70 - \$645.575 = \$461.125$, *Ans.*

Ex. 14. $100\ \% - 4\ \% = 96\ \%$, left after the battle;
$.96 \times .05 = .048 = 4\frac{4}{5}\ \%$, died of wounds;
$4\frac{4}{5}\ \% - 4\ \% = \frac{4}{5}\ \% = .008$, difference;
$168 \div .008 = 21000$, *Ans.*

Ex. 15. A has $\frac{3}{4}$ and B $\frac{1}{4}$ of the prize;
$1.00 - .40 = .60$; $\frac{3}{4} \times \frac{60}{100} = .45$ of prize, A's remainder,
$1.00 - .20 = .80$; $\frac{1}{4} \times \frac{80}{100} = .20$ " B's "
$.45 - .20 = .25$; $\$1950 \div .25 = \$7800$, *Ans.*

(**452**, page 265.)

Ex. 1. $1.00 + .15 = 1.15$; $644 \div 1.15 = 560$, *Ans.*

Ex. 2. $1.00 + .04 = 1.04$; $\$815.36 \div 1.04 = \$784$, *Ans.*

Ex. 3. $1.00 + .12 = 1.12$; $\$3800 \div 1.12 = \$3392.86-$, *Ans.*

Ex. 4. $1.00 + .10 = 1.10$; $39600 \div 1.10 = 36000$, *Ans.*

Ex. 5. $1.00 + 1.08 = 2.08 = 208\ \%$ of last year's crop, raised in the two years; hence,
5200 bu $\div 2.08 = 2500$ bu., *Ans.*

Ex. 6. $1.00 + 1.05 = 2.05$;
$\$6970 \div 2.05 = \$3400$, 1st year's crop;
$\$3400 \times 1.05 = \$3570$, 2d " "

Ex. 7. If the number be increased 8 %, the amount will be 108 % of the number; and if this amount be increased 7 %, the whole amount will be 107 % of 108 %, or 1.08×1.07=1.1556 times the number; hence 86.67÷1.1556=75, *Ans.*

Ex. 8. Since he gained 1½ % in measure and 5 % in price, he sold 1.015 times the number of bushels bought, at 1.05 times the buying price; hence he received 1.015×1.05=1.06575 times the cost;
and $4910.976÷1.06575=$4608, *Ans.*

Ex. 9. 1.00=A's proportion;
1.06=B's "
1.04=C's "
3.10=all their money;
$11160÷3.10=$3600, *Ans.*

Ex. 10. The material cost 200 % of the labor; the cost of labor increased 9 %, would be 109 % of the labor; the cost of material increased 6 %, would be 212 % of the labor; hence the cost of the house, thus increased, would be 109 %+212 %=321 % of the cost of labor; and $1284÷3.21=$400, cost of labor;
$400×2 =$800 " material;
$1200, *Ans.*

(453, page 267.)

Ex. 1. 1.00—.10=.90; 504÷.90=560, *Ans.*

Ex. 2. 1.00—.08=.92; $4.37÷.92=$4.75, *Ans.*

Ex. 3. 1.00—.15=.85; 40 bu. 3⅕ pk.=40.8 bu.;
40.8 bu.÷.85=48 bu., *Ans.*

Ex. 4. 1.00—.36=.64; 224 A.÷.64=350 A., *Ans.*

Ex. 5. 1.00—.65=.35; $\$2590\div.35=\$7400$, *Ans.*

Ex. 6. Having drawn out 20 % of his deposit, he had
100 %—20 %=80 % of his deposit, in bank; and
80 % of his deposit is 80 % of 80 % of his fortune;
.80×.80=.64; $\$5760\div.64=\$9000$, *Ans.*

Ex. 7. 100 %—12 %=88 % of his share sold to B; and
$\frac{7}{8}\times\frac{88}{100}=.77$ of the ship sold to B;
$\$20020\div.77=\$26000$, *Ans.*

Ex. 8. 1.00—.10=.90, left after the first battle;
.90×.10=.09; .90—.09=.81, left after 2d battle;
6480÷.81=8000 men, *Ans.*

Ex. 9. B's asking price was 1.00+.50=1.50=150 % of A's;
1.00—.20=.80; that is, A's reduced price was 80 % of his asking price; 1.50×.30=.45; 1.50—.45 =1.05; that is, B's reduced price was 105 % of A's asking price; hence the sum of the reduced prices was 80 %+105 %=185 % of A's asking price; and $\$148\div1.85=\$80$, A's asking price;

$\$80\times1.50=\$120$, B's " "

NOTE.—In this solution A's asking price is the *base* to which all the rates are referred.

Ex. 10. Of the whole sum expended, $\frac{1}{3}$ was for wheat, $\frac{1}{3}$ for corn, and $\frac{1}{3}$ for oats; hence we have
6 % of $\frac{1}{3}=2$ %, cleared on wheat;
3 % of $\frac{1}{3}=1$ %, " " corn;
17 % of $\frac{1}{3}=5\frac{2}{3}$ %, lost " oats;

$2\frac{2}{3}$ %, net loss;
$1.00—.02\frac{2}{3}=.97\frac{1}{3}$, saved;
$\$2336\div.97\frac{1}{3}=\$2400$, whole sum expended;
$\$2400\div3=\$800$, sum expended for each kind

APPLICATIONS OF PERCENTAGE.

COMMISSION.

(**462**, page 270.)

Ex. 4. $\$8600\times.02\frac{1}{4}=\$193.50$, *Ans.*

Ex. 5. $\$750.75\times.03\frac{3}{4}=\$28.15+$, *Ans.*

Ex. 6. $\$1.40\times3500=\$4900$
$\$\ .74\times3600=2664$
$\$7564\times.02\frac{1}{4}=\$170.19$, *Ans.*

Ex. 7. $\$.23\frac{1}{2}\times2000=\$\ 470$
$.22\times5650=\ 1243$
$.23\times\ 450=\ 103.50$
$.21\times\ 650=\ 136.50$
$\$1953.\ \times.08\frac{1}{3}=\$162.75$, *Ans*

Ex. 8. $\$25372\times.06\frac{1}{4}=\$1585.75$, commission;
132. , storage;
$\$1717.75$, entire charges;
$\$25372-\$1717.75=\$23654.25$, *Ans.*

Ex. 9. $\$25\times40=\$1000$, cost of apple trees;
$50\times20=\ 1000$, “ “ pear “
$20\times16=\ \ 320$, “ “ peach “
$50\times18=\ \ 900$, “ “ cherry “
$50\times\ 5=\ \ 250$, “ “ plum “
$\$3470$, amount of sale;
$\$3470\times.30=\$1041$, commission;
$\$\ 203.50$, expended;
$\$3470-\$1244.50=\$2225.50$, proceeds, *Ans*

Ex. 10. $\$785\times.82=\$643.70$, sum collected;
$\$643.70\times.05=\$32.185$, commission, *Ans.*

Ex. 11. $1.25×4000=$5000, cost;
$1.50×4000=$6000, receipts;
$6000×.03=$180, commission;
$180+$415=$595; $6000—$595=$5405, net proceeds · $5405—$5000=$405, *Ans.*

Ex. 12 $63÷$1260=.05=5 %, *Ans.*

Ex. 13. $4.50×264=$1188, base of commission;
$74.25÷$1188=.0625=6¼ %, *Ans.*

Ex. 14. $7850—$7732.25=$117.75, commission;
$117.75÷$7850=.015=1½ %, *Ans.*

Ex. 15. $.12½×28000=$3500, receipts;
$35.36+$10.50=$45.86, charges;
$3500—$3252.89=$247.11, com. and charges;
$247.11—$45.86=$201.25, commission;
$201.25÷$3500=.0575=5¾ %, *Ans.*

Ex. 16. $5635+$115=$5750, receipts;
$115÷$5750=.02=2 %, *Ans.*

Ex. 17. $22.40÷.04=$560, *Ans.*

Ex. 18. $6.80÷.08=$85, *Ans.*

Ex. 19. $255÷1.02=$250 to be invested;
$250=$.15=1666⅔ yd., *Ans.*

Ex. 20. $7.50×860=$6450, receipts;
$6450×.02½=$161.25, commission on sale;
$6450—$161.25=$6288.75, net proceeds of sale ·
$6288.75÷1.015=$6195.81+, *Ans.*

Ex. 21. $.06×24000=$1440, receipts for pork;
$1440×.05=$72, commission on sale of pork ·
$1440—$72=$1368, net proceeds;
$3000+$1368=$4368;
$4368÷1.05=$4160 to be invested;

$\$4368-\$4160=\$208$, commission for investing,
$\$72+\$208=\$280$, *Ans.*

Ex. 22. $1.00-.06=.94$; $\$3290\div.94=\$3500$, *Ans.*

Ex. 23. $\$6290+\$500=\$6790$, receipts, less the commission
$1.00-.03=.97$; $\$6790\div.97=\$7000$, receipts;
$\$7000\div500=\$14$, *Ans.*

Ex. 24. $\$3500\times.04=\$140$, purchase commission;
$\$3500+\$140=\$3640$, net proceeds of auction sale;
$1.00-.09=.91$; $\$3640\div.91=\$4000$, *Ans.*

Ex. 25. Since the purchase commission was 2 % of the price of the city lots, the net proceeds of the sale of cotton were 102 % of the cost of the city lots; and as the proceeds divided by 1 minus the rate equal the sale, we have $102\ \%\div.97=105\frac{15}{97}\ \%$; that is, the sale of the cotton was $105\frac{15}{97}$ % of the price of the city lots; now, as the difference between the receipts from the cotton and the price of the lots is the whole commission, \$265 is $1.05\frac{15}{97}-1.00=5\frac{15}{97}$ % of the price of the lots; therefore,

$$\$265\div.05\tfrac{15}{97}=\$5141,\ \textit{Ans}$$

Ex. 26. $1.-.0075=.9925$;
$\$5000\div.9925=\$50377.83+$, *Ans.*

STOCKS.

STOCK-JOBBING.

(**480**, page 275.)

Ex. 4. $\$1500\times1.12=\$1680$, *Ans.*

Ex 5. $\$1.35-\$.0175=\$1.3325$, proceeds of \$1;
$\$2000\times1.3325=\$2665$, *Ans.*

Ex. 6. \$.8075+\$.005=\$.8125, cost of \$1 of stock;
\$12000×.8125=\$9750, *Ans.*

Ex. 7. 1.075+.0025=1.0775;
\$3600×1.0775=\$3879, *Ans.*

Ex. 8. 1.00—.60$\frac{7}{8}$=.39$\frac{1}{8}$=.39125;
\$21910÷.39125=\$56000=560 shares, *Ans.*

Ex. 9. \$40150—\$40000=\$150, premium;
$\$150 \div \$40000 = \frac{150}{40000} = \frac{3}{800} = \frac{3}{8}$ %, *Ans.*

Ex. 10. \$.94875+\$.0125=\$.96125, cost of \$1;
\$48447÷.96125=\$50400=504 shares, *Ans.*

Ex. 11. \$6×830=\$4980, receipts; \$4980×.05=\$249, commission; \$4980—\$249=\$4731, net proceeds of sale;
.82$\frac{3}{4}$+.00$\frac{1}{4}$=.83;
\$4731÷.83=\$5700=57 shares, *Ans.*

Ex. 12. \$500×18=\$9000, par value of stock;
.02+.28=.30, rate of loss;
\$9000×.30=\$2700, *Ans.*

Ex. 13. \$3600× .95=\$3420, value of railroad bonds;
\$2700×1.03= 2781, value of bank stock;

\$ 639, *Ans.*

Ex. 14. $\frac{525 \times 104}{105}$=520 shares, *Ans.*

Ex. 15. \$1200×1.05=\$1260, purchase price;
\$1260—\$96=\$1164, selling price;
\$1164÷\$1200=.97=97 %, price per share, *Ans.*

Ex. 16. \$64000×1.02=\$65280, cost;
\$65280+\$2560=\$67840, to be sold for;
\$67840÷\$64000=1.06=106 %, *Ans.*

(275, 278)

Ex. 17. $\$25000\times1.03=\$25750$, cost of mining stock;
$\$15000\times .95=14250$, " " railroad "
$\$40000$, money invested;
$\$40000\div.80=\$50000$, par val. of N. Y. C. stock;
$\$50000\times.85=\$42500$, money received;
$\$42500-\$40000=\$2500$, *Ans.*

Ex. 18 $\$750\div.03=\$25000=250$ shares, *Ans.*

Ex. 19. $105\%-103\%=2\%$, gained;
$\$240\div.02=\$12000$, *Ans.*

Ex. 20. $4\%+5\frac{1}{2}\%=9\frac{1}{2}\%$, loss;
$\$760\div.095=\$8000=80$ shares, *Ans.*

Ex. 21. $1.06+.0125=1.0725$;
$\$6864\div1.0725=\$6400$, par value of bonds bought,
$1.12-.015=1.105$;
$\$6400\times1.105=\$7072$, stock sold for;
$\$7072-\$6864=\$208$, *Ans.*

Ex. 22. $7\%-3\%=4\%$, gain;
$\$480\div.04=\$12000$, par value of stock;
$\$12000\times1.03=\$12360$, money invested, *Ans.*

Ex. 23. $.04+.005=.045$; $1.00-.045=.955$;
$\$4775\div.955=\$5000=50$ shares, *Ans.*

INSTALLMENTS, ASSESSMENTS AND DIVIDENDS.

(**487**, page 277.)

Ex. 3. $\$5600\times.08=\$448$, *Ans.*

Ex. 4. $\$15000\times.06=\$900=9$ shares,
$\$15000=150$ "
159 shares, *Ans.*

Ex. 5. $6500×.15=$975, *Ans.*

Ex. 6. $600÷.04=$15000, *Ans.*

Ex. 7. $99280—$56400=$42880, dividend;
$42880÷$536000=.08=8 %, *Ans.*

Ex. 8. $56000×.06=$3360, dividend;
$3616—$3360=$256, *Ans.*

Ex. 9. $450000×.05$\frac{5}{9}$=$25000, interest;
$25000+$217621=$242621, disbursements;
$407399—$242621=$164778, net earnings;
$164778—$78=$164700, dividend;
$164700÷$1830000=.09, rate of dividend;
$3000×.09=$270, *Ans.*

Ex. 10. $540000
400000
$940000, entire cost of the road;
800000, capital stock available;
$140000, to be assessed;
$140000÷$800000=.17½=17½ %, *Ans.*

Ex. 11. $156753.19÷.0525=$2,985,775 nearly, *Ans.*

Ex. 12. $574375.25
643672.36
$1218047.61, gross earnings;
651113.53
.08) $566934.08, net earnings;
$7086676, capital stock, *Ans.*

Ex. 13. 504÷1.05=480, *Ans.*

Ex. 14. .06÷.75=.08; hence, a 6 % dividend invested at 75 % is equal to an 8 % dividend invested at par;

(277, 278)

Therefore,
\$16200 ÷ 1.08 = \$15000, his stock before the div.;
\$16200 − \$15000 = \$1200, increase of his stock;
\$1200 × .75 = \$900, value of the increase at 75 %;
or the money received in the dividend, *Ans.*

Ex. 15. .05 + .05 = .10, annual rate of dividend;
\$28000 × .10 = \$2800, dividend;
\$2800 + \$2950 = \$5750, *Ans.*

STOCK INVESTMENTS.

(**490**, page 281.)

Ex. 1. \$35374.80 ÷ 1.025 = \$34512, stock purchased;
\$34512 × .05 = \$1725.60, income;
\$1725.60 − \$1000 = \$725.60, *Ans.*

Ex. 2. $.95\frac{1}{2}$ + $.00\frac{1}{2}$ = .96; 1.12 + $.00\frac{1}{2}$ = $1.12\frac{1}{2}$;
\$48000 ÷ 2 = \$24000, invested in each kind of stock;
\$24000 ÷ .96 = \$25000, purchased of 5 % stock;
\$24000 ÷ $1.12\frac{1}{2}$ = $\$21333.33\frac{1}{3}$, " 6 % "
\$25000 × .05 = \$1250, income from the 5's;
$\$21333.33\frac{1}{3}$ × .06 = \$1280, " " " 6's;
\$1250 + \$1280 = \$2530, *Ans.*

Ex. 3. \$32300 ÷ .85 = \$38000, purchase of 6's;
\$32300 ÷ .95 = \$34000, " " 7's;
\$38000 × .06 = \$2280, income from 6's;
\$34000 × .07 = \$2380, " " 7's;
\$100, *Ans.*

Ex. 4. 1.05 + $.00\frac{1}{2}$ = 1.055, cost of \$1 of stock;
\$8229 ÷ 1.055 = \$7800, stock purchased;
\$7800 × .06 = \$468, income from stock;
\$468 − \$411.45 = \$56.55, increase, *Ans.*

Ex. 5. \$8700 × .06 = \$522, income from 5–20's;
$1.04 - .00\frac{1}{2} = 1.035$;
\$8700 × 1.035 = 9004.50;
\$9004.50 − \$.91 (cost of revenue stamps) = \$9003.59, *Ans.*, left to invest in 10–40's.
$.94 + .00\frac{1}{2} = .945$;
\$9003.59 ÷ .945 = \$9527.608, stock purchased;
\$9527.608 × .05 = \$476.38, income from 10–40's;
\$522 − 476.38 = \$45.62, lost, *Ans.*

(491, page 282.)

Ex. 1. \$960 ÷ .06 = \$16000, stock required;
\$16000 × .84 = \$13440, investment, *Ans.*

Ex. 2. \$1500 ÷ .06 = \$25000, stock required;
\$25000 × .97 = \$24250, investments, *Ans.*

Ex. 3. \$1752 ÷ .073 = \$24000, stock required;
\$24000 × 1.06 = \$25440, investment, *Ans.*

Ex. 4. \$15600 × .97 = \$15132, proceeds of 10–40's;
\$540 ÷ .06 = \$9000, stock required;
\$9000 × 1.07 = \$9630, investment;
\$15132 − \$9630 = \$5502, cost of house, *Ans.*

Ex. 5. 1.075 + .005 = 1.08; .985 + .005 = .99;
Suppose he invests \$1 in U. S. 5–20's; then will he invest \$2 in U. S. 10–40's; then
$\$1.00 \div 1.08 = \$\frac{25}{27}$ U. S. 5–20's purchased;
$\$2.00 \div .99 = \$\frac{200}{99}$ U. S. 10–40's "
$\$\frac{25}{27} \times .06 = \$\frac{1}{18}$, income from 5–20's;
$\$\frac{200}{99} \times .05 = \$\frac{10}{99}$, " " 10–40's;
$\$\frac{1}{18} + \$\frac{10}{99} = \$\frac{31}{198}$, income from investing \$3;
And to receive an income of \$1674 he must invest \$3 (that is \$1 in 5–20's, and \$2 in 10–40's) as many times as $\$\frac{31}{198}$ is contained times in \$1674, which is 10692 times; he must therefore invest \$10692 in 5–20's, and twice that sum, that is \$21384, in 10–40's.

(**492**, page 283.)

Ex. 1. $.06 \div 1.08 = .05\frac{5}{9} = 5\frac{5}{9}$ %, *Ans.*

Ex. 2. $.06 \div .84 = .07\frac{1}{7} = 7\frac{1}{7}$ %, *Ans.*

Ex. 3. $1.34\frac{1}{2} + .01\frac{1}{2} = 1.36$;

$.085 \div 1.36 = .0625 = 6\frac{1}{4}$ %, *Ans.*

Ex. 4. $.05 \div .70 = .07\frac{1}{7}$, rate on investment in 5's;

$.06 \div .80 = .07\frac{1}{2}$ “ “ “ “ 6's better.

Ex. 5. $$\left.\begin{array}{l} .08 \div 1.20 = .06\frac{2}{3}, \\ .05 \div \ \ .75 = .06\frac{2}{3}, \end{array}\right\} \text{ rates on investments equal.}$$

Ex. 6. $.073 \div 1.06 = .06\frac{47}{53} = 6\frac{47}{53}$ %, *Ans.*

Ex. 7. $.06 \div 1.085 = .05\frac{115}{217}$, rate on investment in 5–20's;

$.05 \div .98 = .05\frac{5}{49}$, “ “ “ 10–40's;

$.05\frac{115}{217} - .05\frac{5}{49} = .00\frac{650}{1519} = \frac{650}{1519}$ %, *Ans.*

Ex. 8. \$10000 $\div .98 =$ \$10204.08 +, purchase of 10–40's;

\$10204.08 $\div 1.02 =$ \$10004, “ “ 7.30's;

\$10004 × .073 = \$730.292, income from 7.30's;

\$730.292 ÷ \$10000 = .073 + $= 7\frac{3}{10}$ %, nearly, *Ans.*

Ex. 9. $.06 \div 1.05 = .05\frac{5}{7} = 5\frac{5}{7}$ %, *Ans.*

(**493**, page 284.)

Ex. 1. $.05 \div .08 = 62\frac{1}{2}$ %, *Ans.*

Ex. 2. $.06 \div .0625 = 96$ %, purchase price;

100 % − 96 % = 4 %, *Ans.*

Ex. 3. $.07 \div .06 = 1.16\frac{2}{3}$, market price;

$1.16\frac{2}{3} - 1 = .16\frac{2}{3} = 16\frac{2}{3}$ %, *Ans.*

Ex. 4. $.06 \div .08\frac{1}{3} = 72$ %, *Ans.*

Ex. 5. $.05 \div .06 = .83\frac{1}{3} = 83\frac{1}{3}$ %, *Ans.*

Ex. 6. $.06 \div .05 = 1.20$, purchase price;

$1.20 - 1.00 = .20 = 20$ %, premium, *Ans.*

Ex. 7. $.073 \div .10 = .73$, purchase price;

$1.00 - .73 = .27 = 27$ %, discount, *Ans.*

Ex. 8. $.06 \div .07 = .85\frac{5}{7} = 85\frac{5}{7}$ %, *Ans.*

GOLD INVESTMENTS.

(**493 *a*,** page 286.)

Ex. 2. $\$1.42\frac{3}{4} \times 250.47 = \$357.546-$. *Ans.*

Ex. 3. $\$6000 \times .05 = \$300$, income in gold;
$\$1.57 \times 300 = \$471$, " " currency, *Ans.*

Ex. 4. $\$1.385 \times 5500 = \$7617.50$, cost in currency by second offer;
$\$7617.50 - \$7000 = \$617.50$, loss, *Ans.*

Ex. 5. $\$1.40 \times 3 = \$4.20$, cost of cloth in currency;
$\$4.20 - \$4.00 = \$.20$, loss in currency per yd.;
$\$.20 \div \$4.20 = .04\frac{16}{21} = 4\frac{16}{21}\ \%$, *Ans.*

Ex. 6. $\$1.34 \times 3000 = \$4020$, value of gold in currency;
$\$4020 \div 1.02 = \$3941\frac{3}{17}$, stock purchased;
$\$3941\frac{3}{17} \times .06 = \$236.47\frac{3}{51}$, income on stock in gold;
$\$236.47\frac{3}{51} \times 1.34 = \$316.87\frac{1}{17}$, " " " " currency, *Ans.* to first.
$\$316.87\frac{1}{17} \div \$4020 = .07\frac{15}{17} = 7\frac{15}{17}\ \%$, *Ans.* to last.

Ex. 7. $\$10000 \div 1.04 = \$9615\frac{5}{13}$, stock purchased;
$\$9615\frac{5}{13} \times .06 = \$576.92\frac{4}{13}$, income in gold;
$\$1.37 \times 576.92\frac{4}{13} = \$790.38\frac{6}{13}$, " " currency, *Ans.*

(**493 *a*,** Case II., page 286.)

Ex. 2. $\$1.00 \div \$2.03 = .49\frac{53}{203} = 49\frac{53}{203}\ \%$, *Ans.*

Ex. 3. $\$1.00 \div \$1.34 = .74\frac{42}{67} = 74\frac{42}{67}\%$;
$100\ \% - 74\frac{42}{67}\ \% = 25\frac{25}{67}\ \%$, *Ans.* to first.
$\$1.00 \div \$3.98 = .25\frac{25}{199} = 25\frac{25}{199}\ \%$;
$100\ \% - 25\frac{25}{199}\ \% = 74\frac{174}{199}\ \%$, *Ans.* to the last.

Ex. 4. $\$1.00 \div \$.20 = 5.00 = 500\ \%$, *Ans.* to first.
$\$1.00 \div \$.30 = 3.33\frac{1}{3} = 333\frac{1}{3}\ \%$, " " second.
$\$1.00 \div \$.50 = 2.00 = 200\ \%$, " " third.
$\$1.00 \div \$.15 = 6.66\frac{2}{3} = 666\frac{2}{3}\ \%$, " " fourth.
$\$1.00 \div \$.25 = 4.00 = 400\ \%$, " " fifth.
$\$1.00 \div \$.72 = 1.38\frac{8}{9} = 138\frac{8}{9}\ \%$, " " sixth.

Ex. 5. $\$250 \div 1.75 = \$142\frac{6}{7}$, value of currency in gold;
$\$142\frac{6}{7} \div \$.25 = 571\frac{3}{7}$ yds., *Ans.*

Ex. 6. $\$7800 \times .073 = \$569.40$, income from 7.30's in cur.;
$\$569.40 \div 1.45 = \$392\frac{20}{29}$ “ “ “ gold;
$\$7800 \times 1.05 = \$8190$, selling price of 7.30's;
$\$8190 \div 1.45 = \$5648\frac{8}{29}$, gold purchased;
$\$5648\frac{8}{29} \div .60 = \$9413\frac{23}{29}$, 10–40's purchased;
$\$9413\frac{23}{29} \times .05 = \$470\frac{20}{29}$, inc. from 10–40's in gold;
$\$470\frac{20}{29} - \$392\frac{20}{29} = \$78$, increase of income, *Ans.*

Ex. 7. The income from $1.00 invested in bond and mortgage is $.07 in currency, and
$\$.07 \div \$1.34 = .05\frac{15}{67} = 5\frac{15}{67}\ \%$, income in gold from mortgage;
$5\frac{15}{67}\ \% - 5\ \%$ (rate of income on 10–40's) $= \frac{15}{67}\ \%$, mortgage better than 10–40's.

PROFIT AND LOSS.

(**495**, page 287.)

Ex. 4. $\$7650 \times .20 = \$1530$, advance;
$\$1530 - \$480 = \$1050$, *Ans.*

Ex. 5. $\$.15 \times 320 = \$48$, cost; $\$48 \times .025 = \$1.20$, *Ans.*

Ex. 6. $\$3.50 \times 30 = \$105$, purchase price;
$\$105 \times .90 = \$94.50$, selling “
$\$94.50 \times .05 = \$4.72\frac{1}{2}$, commission;
$\$105 + \$4.72\frac{1}{2} + \$5.38 = \$115.10\frac{1}{2}$, whole outlay;
$\$115.10\frac{1}{2} - \$94.50 = \$20.60\frac{1}{2}$, *Ans.*

Ex. 7. $1 + .33\frac{1}{3} = 1.33\frac{1}{3} = 1\frac{1}{3}$; $\$.50 \times 1\frac{1}{3} = \$66\frac{2}{3}$, *Ans.*

Ex. 8. $\$1.93-\$4.25=\$.68$, gain per quintal;
$\$.68\div\$4.25=.16=16\ \%$, *Ans.*

Ex. 9. $\$59\times.20=\$11.80$, advance of $20\ \%$;
$\$59+\$11.80+\$4.72=\$75.52$, to be sold for;
$\$75.52\div944=\$.08$, *Ans.*

Ex. 10. $\$157.50\times.05=\$7.875$, whole loss;
$\$157.50-\$7.875=\$149.625$, sold for;
$\$149.625\div\$3.325=45$ gallons sold;
63 gal.—45 gal. = 18 gal., *Ans.*

Ex. 11. 106 A. 150 P. = 106.9375 A.;
$\$96\times106.9375=\$10266$, selling price;
$\$10266\div1.18=\$8700$, *Ans.*

Ex. 12. $\$21.12\times36.840=\$778.0608$, sold for;
$\$778.0608\div1.28=\$607.86$, cost;
$\$17\times36.840=\$626.28$, value at \$17 per M.,
$\$626.28-\$607.86=\$18.42$ gain, *Ans.*

Ex. 13. $1-.04=.96=96\ \%$, purchase price;
$1-.28=.72=72\ \%$, selling "
$96\ \%-72\ \%=24\ \%$, difference of prices;
$.24\div.96=.25=25\ \%$, *Ans.*

Ex. 14. $\$7050\div.94=\$7500$, cost;
$\$7500\times1.12\frac{1}{2}=\$8437.50$, *Ans.*

Ex. 15. $\$182\div.875=\$208$, cost of second;
$\$208\div1.30=\$160$, " " first

Ex. 16. $15\ \%$ on $\frac{1}{4}$ is $\frac{1}{4}$ of $15\ \%=3\frac{3}{4}\ \%$ on the whole.
$18\frac{3}{4}\ \%$ on $\frac{1}{3}$ is $\frac{1}{3}$ of $18\frac{3}{4}\ \%=6\frac{1}{4}\ \%$ " " "
$20\ \%$ on $\frac{1}{6}$ is $\frac{1}{6}$ of $20\ \%=3\frac{1}{3}\ \%$ " " "
$33\frac{1}{3}\ \%$ on $\frac{1}{4}$ is $\frac{1}{4}$ of $33\frac{1}{3}\ \%=8\frac{1}{3}\ \%$ " " "
$\overline{21\frac{2}{3}\ \%}$; rate of grain.
$\$6840\times.21\frac{2}{3}=\$1482$, entire gain, *Ans.*

Ex. 17. 100% cost;
$1.00\times1.50=150\%$, after 1 year;
$1.50\times1.50=225\%$, " 2 years;
$2.25\times1.50=337\frac{1}{2}\%$, " 3 "
$3.375\times1.50=506\frac{1}{4}\%$, " 4 "
$\$12000\div5.0625=\$2370.37\frac{1}{27}$, *Ans.*

Ex. 18

$$\left.\begin{array}{l}\$1.80\times600=\$1080\\ \$1.62\frac{1}{2}\times1200=\$1950\end{array}\right\}=\$3030$$

$\$1\ 25\times200=\ 250$

$\$3280$, cost;
$\$3030\times1.20=\$3636$, receipts from first two kinds;
$\$1.20\times200=\$\ 240$, " " third "

$\$3876$, total receipts;
$\$3876\times.05=\$193.80$, commission;
$\$3876-(\$193.80+\$254.60)=\$3427.60$, proceeds;
$\$3427.60-\$3280=\$147.60$, gain;
$\$147.60\div\$3280=4\frac{1}{2}\%$, *Ans.*

Ex. 19. $100\%-20\%=80\%$, buying price;
$100\%-16\%=84\%$, selling "

$4\%\div80\%=5\%$, *Ans*

Ex. 20. Suppose he sells 1 share of $\$100$; then $\$100\times.05=\$5.00$, annual income parted with;
$\$78\div1.04=\$75$, stock purchased;
$\$75\times.06=\$4.50$; annual income in return;
$\$5.00-\$4.50=\$.50$ " " lost;
$\$.50\div\$5.00=.10=10\%$, *Ans.*

Ex. 21 $\$125\times12=\$1500$, received for each half;
$\$1500\div1.25=\$1200$, cost of one half;
$\$1500\div.75=\$2000$, " " the other half;

$\$1200+\$2000=\$3200$, cost of the whole;
$\$1500\times2 = 3000$, received for the whole;

$\$\ 200$ lost, *Ans.*

Ex. 22. $\$30\times1.20=\$36$, selling price;
$\$36\div.75=\$48$, asking price, *Ans.*

Ex. 23. He asked 120 % of the cost, and sold at 1.00—.20 =80 % of the asking price. Hence $120\times.80=.96$; $1.00-.96=.04=4$ % loss, *Ans.*

Ex. 24. $\$.05\times216\times200=\$2160$, cost of N. O. sugar;
$\$.05\frac{3}{4}\times200\times560=6440$, “ “ W. I. “

$\$8600$, entire cost;
$\$2160\times.99=\$2138.40$, rec'd for N. O. sugar
$\$6440\times1.00\frac{20}{23}=6496$, “ “ W. I. “

$\$8634.40$, “ “ the whole;
$\$8634.40-\$8600=\$34.40$, gain;
$\$34.40\div\$8600=.004=\frac{2}{5}$ % gain, *Ans.*

Ex. 25. $\$31.50\div.70=\$45$, prime cost of the whole;
$\$45\div63=\$.71\frac{3}{7}$, purchase price per gallon, *Ans*

Ex. 26. $1.00-.07\frac{3}{5}=.92\frac{2}{5}=.924$, selling price;
$.924\div1.05=.88$, purchase price;
$1.00-.88=.12=12$ %, *Ans.*

Ex. 27. $\$.025\div.08=\$.31\frac{1}{4}$, *Ans.*

Ex. 28. $\$.75\div.1875=\$4.00$, cost;
$\$4.00\times.31\frac{1}{4}=\$1.25$, advance on cost;
$\$1.25-\$.75=\$.50$, *Ans.*

Ex. 29 30 % of $\frac{3}{5}=.18$ of the whole;
5 % of $\frac{2}{5}=.02$ “ “

$\$720\div.16=\$4500$, investment;

30 % of $\frac{2}{5}$=.12, of the whole;
5 % of $\frac{3}{5}$=.03, " "

$4500×.09=$405, *Ans*

Ex. 30. His asking price was 136 % of the cost, and his selling price was 100 %—16 %=84 % of his asking price, or 1.36×.84=1.1424=114$\frac{24}{100}$ % of the cost. Hence the gain was 14$\frac{24}{100}$ % of the cost; and $740.48÷.1424=$5200, the cost;
$5200×1.36=$7072, the asking price;
$5200×1.1424=$5940.48, sold for, *Ans.*

Ex. 31. Since his gain on $\frac{5}{8}$ was $\frac{3}{8}$, we have $\frac{3}{8}$÷$\frac{5}{8}$=.60=60 %, the rate of gain, *Ans.*

Ex. 32. ($.375×84×4)+$7.50=$133.50, whole cost;
$133.50×1.25=$166.875, net avails required;
$166.875÷.99=$168.56, to cover the collector's fee;
$168.56÷.96=$175.58, whole sum to be obtained to cover bad debts and collector's fee; but 84 gal. ×4=336 gal. bought; 336 gal.×.05=16.8 gal. leakage and waste; 336 gal.—16.8 gal.=319.2 gal. left for sale. Hence, $175.58÷319.2=$.55+, *Ans.*

INSURANCE.

FIRE AND MARINE INSURANCE.

(**503**, page 291.)

Ex. 3. $5860×.015=$87.90, *Ans.*

Ex. 4. $860×.005=$4.30, *Ans.*

Ex. 5. $3500×.01$\frac{1}{4}$=$43.75, *Ans.*

Ex. 6. $\$10000 \times .0225 = \$225$, premium;
$\$10000 - \$225 = \$9775$, *Ans.*

Ex. 7. $\$6000 \times .01\frac{1}{4} = \$75$, premium,
$\$6000 - (\$75 + \$5.50) = \$5919.50$ **covered:**
$\$10000 - \$5919.50 = \$4080.50$, *Ans.*

Ex. 8. $\$12000 \times \frac{4}{5} = \$9600$, policy;
$\$9600 \times .00\frac{3}{4} = \$72$, premium;
$\$9600 - \$72 = \$9528$, covered by insurance;
$\$12000 - \$2000 = \$10000$, whole loss;
$\$10000 - \$9528 = \$472$, owner's loss, *Ans.*

Ex. 9.
$$\begin{array}{lll} \$36000 \times .02\frac{1}{2} = & \$900, & \text{premium received;} \\ \$18000 \times .03 = & \underline{540,} & \text{'' paid out;} \\ & \$360, & \textit{Ans.} \end{array}$$

Ex. 10. $\$12 \div \$800 = .015 = 1\frac{1}{2}\ \%$, *Ans.*

Ex. 11. $\$107.25 \div .0325 = \$3300$, policy;
$\$3300 \div .80 = \$4125$, cost of wheat;
$\$4125 \div 500 = \$8.25$, price per barrel, *Ans.*

Ex. 12. $\$280 \div \$16000 = .0175 = 1\frac{3}{4}\ \%$, *Ans*

Ex. 13.
$$\begin{array}{ll} \$20000 \times .00\frac{3}{4} = & \$150 \\ \underline{30000} \times .00\frac{1}{2} = & \underline{150} \\ \$50000 & \$300 \div \$50000 = .006 = \frac{3}{5}\ \%,\ \textit{Ans} \end{array}$$

Ex. 14. $\$46.75 \div .01375 = \$3400$, policy;
$\$3400 \times 2 = \$6800$, *Ans.*

Ex. 15. $1 - .01125 = .98875$; $\$7910 \div .98875 = \$8000$, *Ans*

Ex. 16. $1 - .02\frac{3}{7} = .97\frac{4}{7}$; $\$27320 \div .97\frac{4}{7} = \$28000$, policy;
$\$28000 - \$27320 = \$680$, *Ans.*

Ex. 17. $\$122.50 \div .04\frac{3}{8} = \$1400$, policy;
$\$1400 \div \frac{5}{8} = \$4480$, *Ans.*

Ex. 18. On each \$1 which the house is worth, he obtains an insurance of \$.75, for which he pays during the 5 years, $\$.75\times.015\times5=\$.05625$; hence the insurance will cover $\$.75-\$.05625=\$.69375$; and his loss on the \$1 will be $\$1-\$.69375=\$.30625$; therefore, $\$2940\div.30725=\$9600$, *Ans.*

Ex. 19. $1.00\div.025=40$ years, *Ans.*

Ex. 20. $.025\times\frac{3}{5}=.015$, the per cent. of the policy paid for re-insuring; hence $.0225-.015=.0075$;
and $\$72\div.0075=\$9600$, *Ans.*

Ex. 21. The two companies together must lose $1-.0425=.9575$ of the policy; and since the Manhattan Company becomes responsible for .50 of the policy, and receives $.50\times.03=.015$ of the policy in premium, it must lose $.50-.015=.485$ of the policy; therefore, the Commercial Insurance Company will lose $.9575-.485=.4725$ of the policy; and consequently $.485-.4725=.0125$ of the policy is \$1350; hence $\$1350\div.0125=\$108000$, the policy;
$\$108000\div\frac{3}{4}=\$144000$, value ship and cargo;
$\$108000\times.9575=103410$, covered by insurance

\$40590, *Ans.*

LIFE INSURANCE.

(**509,** page 293.)

Ex. 2. $\$113.50\times21=\$2383.50$, amount paid;
$\$2383.50\times.30=\$715.05$, dividend returned;
$\$2383.50-\$715.05=1668.45$, amount paid the Co.;
$\$5000-\$1668.45=\$3331.55$, *Ans.*

Ex. 3. $\$50.11\times5=\$250.55$, *Ans.*

Ex. 4. $37.52 × 4 = $150.08 × 25 = $3752.00, amount paid;
$4000 + $2400 = $6400, amount drawn;
$6400 − $3752 = $2648.00, *Ans.*

Ex. 5. $72.14 × 3 = $216.42, annual premium;
$216.42 × 13 = $2813.46, amount paid;
$37.97 × 3 = $113.91, annual premium life plan;
$113.91 × 13 = $1480.83, am't required " "
$2813.46 − $1480.83 = $1332.63, *Ans.*

Ex. 6. $553.33 × 8 = $4426.64, amount paid;
$127.74 × 8 = $1021.92, annual premium for 5 years;
$1021.92 × 4 = $4087.68;
$4426.64 − $4087.68 = $338.96, *Ans.*

Ex. 7. $10000 + $7000 = $17000, amount drawn;
$48.74 × 10 = $487.40, annual premium;
$487.40 × 20 = $9748.00, amount paid;
$487.40 × .06 = $29.244, int. on each pay't per year;
20 + 19 + 18 + 17 + 16 + 15 + 14 + 13 + 12 + 11 +
10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 210 years;
$29.244 × 210 = $6141.24, interest;
$9748 + $6141.24 = $15889.24;
$17000 − $15889.24 = $1110.76, *Ans.*

Ex. 8. $1000 ÷ $19.89 = 50 +, A's number of payments requiring 50 years; hence 25 + 50 = 75, A's age;
$1000 ÷ $26.38 = 37 +, B's number of payments, requiring 37 years; hence 35 + 37 = 72, *Ans.*

Ex. 9. $51.22 × 6 = $307.32, annual payment;
$6000 − $4463.40 = $1536.60, amount paid;
$1536.60 ÷ $307.32 = 5, *Ans.*

Ex. 10. $31.30 × 5 = $156.50, annual premium;
$156.50 × 4 = $626.00;
$156.50 ÷ 2 = $78.25 × 26 = $2034.50;
$626 + $2034.50 = $2660.50, *Ans.*

Ex. 11. $175.50 × 45.995 = $8072.12, amount paid the Company with compound interest at 6 per cent.;
$8637.34 − $8072.12 = $565.22, *Ans.*

TAXES.

(**514**, page 300.)

Ex. 2.	Tax on	$8000	is	$32.00
	" "	500	"	2.00
	" "	30	"	.12
	" "	3 polls	"	1.50
				$35.62, *Ans.*

Ex. 3.	Tax on	$900	is	$3.60
	" "	80	"	.32
	" "	7	"	.028
	" "	1 poll	"	.50
				$4.448, *Ans.*

Ex. 4. $.25×2156=$539, amount of poll tax,
$6319—($654+$539)=$5126, property tax,
$5126÷$1864000=.00275, rate of taxation for town purposes; .00275+.0015+.0005=.00475, full rate;
$32560×.00475=$154.66, A's property tax;
$.25×3= .75, " poll tax;
$155.41, *Ans.*

Ex. 5. $16840×.00475=$79.99, *Ans.*

Ex. 6. $5561.50÷.98=$5675, *Ans.*

Ex. 7. $9120÷.95=$9600, tax to be raised;
$9600÷$1536000=.00625=⅝ %, *Ans.*

Ex. 8. $1200+$57.65+$38.25=$1295.90, whole expense
$1295.90—$257.75=$1038.15, tax by rate-bill;
$1038.15÷9568=$.108502+, rate per day;
$.108502×46×4=$19.96+, *Ans.*

Ex. 9. $1260.52÷.965=$1306.24+, tax to be assessed,
$1306.24÷.00325=$401920, base of taxation, or valuation of property, *Ans.*

GENERAL AVERAGE.

(518, page 302.)

Ex. 1.

Losses.		*Contributory Interests.*	
Jettson,	$6300	Vessel,	$25000
Repairs, less $\frac{1}{3}$,	1000	Freight, less $\frac{1}{3}$,	2800
Cost of detention,	420	Cargo,	25200
Total,	$7720	Total,	$53000

$7720÷$53000=.1456603+, rate of loss;
$25200×.1456603=$3670.64, payable by Hayden & Co.;
$6300 , receivable " "
$2629.36, balance due " "

Or,
$27800×.1456603=$4049.36, payable by George Law;
1420 , receivable " "
$2629.36, balance due Hayden & Co.

Ex. 2.

Losses.		*Contributory Interests.*	
Jettson,	$1570	Vessel,	$28000
Repairs, less $\frac{1}{3}$,	180	Freight, less $\frac{1}{3}$,	1000
Detention,	120	Cargo,	5000
Total,	$1870	Total,	$34000

$1870÷$34000=.055, rate of loss;
$29000×.055=$1595, contributed by ship owners;
$180+$120 = 300, due " "
$1295, payable by " "
$750×.055=$41.25 " " C;
$2400×.055=$132, contributed by A;
$1400—$132=$1268, receivable " "
$1850×.055=$101.75, contributed by B;
$170—$101.75=$68.25, receivable " "

CUSTOM HOUSE BUSINESS.

(**529**, page 305.)

Ex. 4. $2780×.04=$111.20, *Ans.*

Ex. 5. $.055×1200=$66, cost; $66×.15=$9.90, *Ans.*

Ex. 6. 112 lb.×54=6048 lb., gross weight, long ton measure;
6048 lb.×.035=211.68 lb., tare;
6048 lb.—211.68 lb.=5836.32 lb., net weight;
$.0875×5836.32=$510.678, net value:
$510.678×.15=$76.60+, *Ans.*

Ex. 7. 36 gal.×50=1800 gal., gross measure;
1800 gal.×.015=27 gal., leakage;
1800 gal.—27 gal.=1773 gal., net measure;
$2.50×1773=$4432.50, net value;
$4432.50×.30=$1329.75, duty;
$2.50×1800 = 4500 invoice;
$1.30×50 = 65 freight;
8.50, cartage;
$5903.25, *Ans.*

Ex. 8. 120 doz.×.02=2.4 doz., breakage;
120 doz.—2.4 doz.=117.6 doz., net measure;
$1.25×117.6=$147, net value;
$147×.24=$35.28, *Ans.*

Ex. 9 $619.40÷.19=$3260, *Ans.*

Ex. 10. .05¼×14×600=$441, invoice, base of duty;
$35.28÷$441=.08=8 %, *Ans.*

Ex. 11. $.30× 63×200=$3780
$.05×500×150= 3750
$7530×.24=$1807.20
$2.50×80=$200

$3.00×75=$225

$425×.08= 34

$1841.20, *Ans.*

Ex. 12. 36 gal.×56=2016 gal.;
$907.20÷.30=$3024, cost;
$3024÷2016=$1.50, *Ans.*

Ex. 13. $132÷.24=$550, on which duty was reckoned;
$550÷.88=$625, *Ans.*

Ex. 14. $1980.50—$12.24=$1968.26, invoice and duty;
$1968.26—$1654=$314.26, duty;
$314.26÷$1654=.19=19 %, *Ans.*

Ex. 15. $823.20÷.24=$3430, net value;
$3430÷$.25=13720=1143⅓ doz., *Ans.*

SIMPLE INTEREST.

(**540**, page 311.)

Ex. 3. *Ans.* $.921. Ex. 4. *Ans.* $5.885+.
Ex. 6. *Ans.* $178.94—. Ex. 8. *Ans.* $770.
Ex. 12. *Ans.* $2.80. Ex. 14. *Ans.* $195.765+.
Ex. 15. *Ans.* $12.06+. Ex. 16. *Ans.* $46.875.
Ex. 18. *Ans.* $160.625. Ex. 20. *Ans.* $28.34+.
Ex. 23. *Ans.* $24.18+. Ex. 24. *Ans.* $72.96.
Ex. 29. *Ans.* $40.83⅓. Ex. 30. *Ans.* $11.69+.
Ex. 31. *Ans.* $13.88+. Ex. 33. *Ans.* $2.43—.
Ex. 34. *Ans.*. $26.70+. Ex. 39. *Ans.* $5019.44 4/9.

Ex. 41. Time, 2 yr. 7 mo. 13 da.; $2078.87—, *Ans.*

Ex. 42. Time, 7 yr. 8 mo. 16 da.; $4615.43+, *Ans*

Ex. 43. Time, 2 yr. 4 mo. 15 da.; $42.86+, *Ans.*

Ex. 44. 21 yr.—15 yr. 3 mo. 20 da.=5 yr. 8 mo. 10 da.;
$3754.45+int. for 5 yr. 8 mo. 10 da.
=$5037.22+, *Ans.*

Ex. 45. He gains the difference between the legal rates of interest in the two places, which is 1 % on $7500; hence, $7500×.01=$75, *Ans.*

Ex. 46. Cash, $3200
$3500+int. for 6 mo.= 3622.50
$2500+ " " 10 " = $2645.83\frac{1}{3}$
$2120+ " " 15 " = 2305.50
Ans. $$11773.83\frac{1}{3}$

Ex. 47. $6840+int. from May 10, 1859, to June 21, 1860,
=$7297.14, the cost of the flour;
$6840÷$5.70=1200 barrels purchased;
$6.625×1200=$7950 receipts;
$7950—$7297.14=$652.86, *Ans.*

Ex. 48.
As he pays 7 % per year of 360 days, and, by agreement, receives 6 % per year of 365 days,
The int. in N. Y. $=\frac{146}{360}=\frac{73}{180}$ of a year's int.,
And the int. in O. $=\frac{146}{365}=\frac{2}{5}$ of a year's int.
Hence, he pays $\$15000\times\frac{7}{100}\times\frac{73}{180}=\$425.83\frac{1}{3}$,
He receives $\$15000\times\frac{6}{100}\times\frac{2}{5}=\$360.00$,
And he loses $\$65.83\frac{1}{3}$. *Ans.*

Ex 49. $1250+ interest for 7 mo. 16 da.=$1304.93
$3540.84+ " " 4 " 27 " = 3642.049
$ 575+ " " 3 " = 585.062
$816.90+ " " 1 " 7 " = 822.777
Ans. $6354.818+

Ex. 50. 33×11=363 da., whole time for which he rec'd int.;
.363÷6=$.0605, interest on $1 at 6 %;
$.0605×4=$.242, " " " " 2 % a month;
$.242—$.06=$.182, interest gained on $1;
$.182×1000=$182, *Ans.*

Ex. 51. He gained at the rate of 12½ %—7¾ %=4¾ % per annum, for 2 yr. 5 mo. 10 da.=2$\frac{4}{9}$ yr.; hence $21840×.04¾×2$\frac{4}{9}$=$2535.86⅔, *Ans.*

Ex. 52. $27.50×450=$12375, money borrowed;
$12375+ int. for 4 yr. 11 mo. 20 da.=$15759.22, outlay; $34 ×180=$6120
$32.55×270= 8788.50 returns, 14908.50;
Ans., $850.72.

Ex. 53. $1.12½×4500=$5062.50, cost;
$1.06×4500=$4770, wheat sold for;
$4770×.05=$238.50, interest;
$4770+$238.50=$5008.50, total returns;
$5062.50—$5008.50=$54, loss, *Ans.*

PARTIAL PAYMENTS.

(**543**, page 312.)

Ex. 2.

Amount of note, Oct. 15, 1860, (1 yr.),	$1272.00
Payment,	1000.00
New principal,	$272.00
Amount, April 15, 1861, (6 mo.),	280.16
Payment,	200.00
New principal,	$80.16
Amount, Oct. 15, 1861, (6 mo.),	82.56+, *Ans*

(313—316)

Ex. 3.

Amt. of note. Mar. 4, 1856, (8 mo. 24 da.),	$838.19+
Payment,	210.93
New principal,	$667.26+
Am't, July 9, 1857, (1 yr. 4 mo. 5 da.),	732.01+
Payment,	140.00
New principal,	$592.01+
Amount, Feb. 20, 1858, (7 mo. 11 da.),	613.81+
Payment,	178.00
New principal,	$435.81+
Am't, May 5, 1859, (1 yr. 2 mo. 15 da.),	467.41+
Payment,	154.30
New principal,	$313.11+
Amount, Jan. 17, 1860, (8 mo. 12 da.),	326.26+
Payment,	259.45
New principal,	$66.81
Am't, Oct. 24. 1861, (1 yr. 9 mo. 7 da.),	73.90+, *Ans*

Ex. 4.

Amt. note, Oct. 20, 1861, (1 yr. 1 mo. 16 da.),	$415,34+
Payment,	126.50
New principal,	$288.84
Amount, Jan. 1, 1862, (2 mo. 11 da.),	292.83—, *Ans*

Ex. 5.

Amt. of note, June 1, 1857, (2 mo. 25 da.),	$3516.02+
Payment,	1247.60
New principal,	$2268.42+
Amount, Sept. 10, 1857, (3 mo. 9 da.),	2299.61+
Payment,	1400.00

New principal,	$899.61+
Amount, Jan. 31, 1858, (4 mo. 21 da.),	917.23+, *Ans*

Ex. 6.

Mortgage,	$9750.00
Payment, Oct. 1, 1860,	846.50
Due, Jan. 1, 1861, (9 mo. from date),	$8903.50
Amt., Oct. 20, 1862, (1 yr. 9 mo. 19 da.),	10508.60+
Payment,	2500.00
New principal,	$8008.60+
Amount, July 3, 1863, (8 mo. 13 da.),	8571.43—
Payment,	1500.00
New principal,	$7071.43—
Amount, Jan. 1, 1864, (5 mo. 28 da.),	7421.06+
Payment,	500.00
New principal,	$6921.06+
Amount, Apr. 1, 1865, (1 yr. 3 mo.),	7786.19+, *Ans*

Ex. 7.

Amount of note, May 1, 1861, (3 mo.),	$507.50
Payment,	40.00
New principal,	$467.50
Amount, May 1, 1862, (1 yr.),	495.55
Sum of payments, $8+$12+$30=	50.00
New principal,	$445.55
Amt., Sept. 16, 1862, (4 mo. 15 da.),	455.57+, *Ans*

(**546**, page 314.)

Ex. 1.

Amount, Apr. 1, 1857, (1 yr. 2 mo.),	$1070
1st payment,	80

New principal,	$ 990
Amt., Apr. 1, 1858, (1 yr.),	1049.40
Amt. of 2d payment to date, (8 mo.),	31.20
New principal,	$1018.20
Amt., Dec. 1, 1858, (8 mo.),	1058.93—
Sum of 3d and 4th payments,	610.00
New principal,	$448.93—
Amt., Oct. 1, 1859, (10 mo.),	471.38—
Amt. of 5th payment, to date, (5 mo.),	205.00
	$ 266.38—, *Ans.*

Ex. 2.

Amt. of principal, Jan. 10, 1863, (4 yr. 8 mo.),	$2560
Amt. of 1st indorsement, (3 yr. 10 mo.),	$ 984
“ “ 2d “ (2 yr. 8 mo.),	464
“ “ 3d “ (1 yr. 4 mo.),	324
	$ 788, *Ans.*

Ex. 3.

Amount, May 10, 1859, (1 yr.),	$2120
Am't of 1st payment from Mar. 10 to May 10, 1859, (2 mo.),	808
New principal,	$1312
Am't, May 10, 1860, (1 yr.),	1390.72
2d payment,	400.00
New principal,	$990.72
Am't, Sept. 10, 1861, (1 yr. 4 mo.),	1069.98+
3d payment,	300.00
New principal,	$769.98+
Am't, Jan. 10, 1863, (1 yr. 4 mo.),	831.58+, *Ans.*

By the New Hampshire Rule.

Ex. 4

Am't of note, May 10, 1859, (1 yr.),	$2120
Am't of 1st payment, to date, (2 mo.),	808
New principal,	$1312
Am't, May 10, 1860, (1 yr.),	1390.72
2d payment,	400
New principal,	$990.72
Am't, May 10, 1861, (1 yr.),	1050.16+
Am't, May 10, 1862, (1 yr.),	1113.17+
Am't of 3d payment, (8 mo.),	312.00
New principal,	$801.17+
Am't, Jan. 10, 1863, (8 mo.)	833.21+, *Ans.*

By the United States Rule.

Am't, Mar. 10, 1859, (10 mo.),	$2100
Payment,	800
New principal,	$1300
Am't, May 10, 1860, (1 yr. 2 mo.),	1391
Payment,	400
New principal,	$991
Am't, Sept. 10, 1861, (1 yr. 4 mo.),	1070.28
Payment,	300
New principal,	$770.28
Am't, Jan. 10, 1863, (1 yr. 4 mo.),	831.90+, *Ans.*

SAVINGS BANK ACCOUNTS.

(**549**, page 320.)

Ex. 2.

Sum of deposits, Jan. 20,	$26.80
Draft, Jan. 28,	5
Balance, Feb. 1,	$21.80
Draft, Feb. 7,	8.48
Least balance during current month,	$13.32
Sum of deposits, Feb. 20 and 27,	24.85
Int. on $13.32 for 1 mo.,	.07
Balance, Mar. 1,	$38.24
Deposit, Mar. 6,	14.65
	$52.89
Draft, Mar. 20,	10
	$42.89
Deposit, Mar. 29,	7.98
Int. on $38.24, (least bal.) for 1 mo.,	.19
Balance, Apr. 1,	$51.06
Draft, April 11,	12.76
	$38.30
Deposit, April 25,	3.49
Int. on $38.30 (least bal.) for 1 mo.,	.19
Balance, May 1,	$41.98
Sum of deposits during May,	72.29
Int. on $41.98, (least bal.) for 1 mo.,	.21

Balance, June 1,	$114.48
Sum of drafts during June,	31.92
	$82,56
Int. on $82.56 (least bal.) for 1 mo.,	.41
Balance, July 1,	$82.97
Deposit, July 28,	15.68
Int. on $82.97 (least bal.) for 1 mo.,	.41
Balance, Aug. 1,	$99.06
Deposit, Aug. 3,	18.45
	$117.51
Draft, Aug. 17,	5.64
	$111.87
Deposit, Aug. 26,	4.50
Int. on $99.06 (least bal.) for 1 mo.,	.50
Balance, Sept. 1, 1860,	$116.87, *Ans*

Ex. 3.

Balance, Jan. 1, 1859,	$ 47.50
Deposit, March 12, 1859,	124.36
Int. on $47.50 for 3 mo.,	.83
Balance, April 1, 1859,	$172.69
Draft, May 12, 1859,	50.36
	$122.33
Deposit, June 20, 1859,	130.56
Int. on $122.33 (least bal.) for 3 mo.,	2.14
Balance, July 1, 1859,	$255.03
Deposit, Aug. 3, 1859,	68.75
Int. on $255.03 (least bal.) for 3 mo.,	4.46

Balance, Oct. 1, 1859,	$328.24
Sum of drafts, Oct., Nov., and Dec., 1859,	74.76
	$253.48
Int. on $253.48 (least bal.) for 3 mo.,	4.43
Balance, Jan. 1, 1860,	$257.91
Deposit, Jan. 25, 1860,	160.80
Int. on $257.91 (least bal.) for 3 mo.,	4.51
Balance, April 1 or 4, 1860,	$423.22, *Ans.*

Ex. 4.

Balance, July 1, 1858,	$175
Draft, Sept. 14, 1858,	65
	$110
Deposit, Nov. 1, 1858,	150
Int. on $110 (least bal.) for 6 mo.,	3.30
Balance, Jan. 1, 1859,	$263.30
Deposit, Feb. 24, 1859,	200
Int. on $263.30 (least bal.) for 6 mo.,	7.90
Balance, July 1, 1859,	$471.20
Draft, July 25, 1859,	120
	$351.20
Deposit, Sept. 10, 1859,	56
	$407.20
Draft, Dec 3, 1859,	80
	$327.20
Int. on $327.20 (least bal.) for 6 mo.,	9.82
	$337.02, *Ans.*

Ex. 5.

Deposit, Jan. 1, 1858,		$36.50
Int. on the same for 6 mo.,		.91
Deposit, Mar. 17, 1858,		25.38
Int. on the same for 3 mo.,		.32
Balance, July 1, 1858,		$63.11
Deposit, Aug. 1, 1858,	$84.72	
Draft. Sept. 16, 1858,	36.16	
		48.56
Int. on $63.60 for 6 mo.,		1.58
" " $48.56 " 3 "		.61
Balance, Jan. 1, 1859,		$113.86
Draft, Jan. 27, 1859,	$13.48	
" Mar. 1, "	17.50	
		30.98
		$82.88
Deposit, June 11, 1859,		50
Int. on $84.26 (least bal.) for 6 mo.,		2.07
Balance, July 1, 1859,		$134.95
Deposit, Nov. 16, 1859,		40.78
Int. on $137.21 (least bal.) for 6 mo.,		3.37
Balance, Jan. 1, 1860,		$179.10, *Ans*

COMPOUND INTEREST.

(**550**, page 322.)

Ex. 1. $750 Principal for 1st year;
$750×1.06= 795 " " 2d "
$795×1.06= 842.70 " " 3d "
$842.70×1.06= 893.26 " " 4th "
$893.26×1.06= 946.86, Amount " 4 years;
750 Principal;

Ans. $196.86—, Compound interest.

Ex. 2. $250 Principal for 1st year;
$250×1.07= 267.50 " " 2d "
$267.50×1.07= 286.23 " " 3d "
$286.23×1.07= 306.26+, *Ans.*

Ex. 3. $1475.50 Principal 1st half year;
$1475.50×1.035=$1527.15 " 2d "
$1527.15×1.035= 1580.60 " 3d "
$1580.60×1.035= 1635.92 " 4th "
$1635.92×1.035= 1693.18 " 5th "
$1693.18×1.035= 1752.43+, *Ans.*

Ex. 4. $376 Principal for 1st year;
$376×1.06= 398.56 " " 2d "
$398.56×1.06= 422.47 " " 3d "
$422.47×1.06= 447.81 Prin. for 8 mo. 15 da.;
$447.81×1.0425= 466.84 Amt. 3 yr. 8 mo. 15 da.;
376

$ 90.84+, *Ans.*

(**551**, page 320.)

Ex 2 $536.75×2.51817=$1351.63—, *Ans.*

Ex 3. There will be 5 half years and 3 mo. 12 days over;
$.019\frac{5}{6}$, simple interest of $1 for 3 mo. 12 da.;
$.194\frac{5}{6}$ " " " " " 2 yr. 9 mo. 12 da.,
$1275×1.187686=$1514.299+, amt. of the given sum at $3\frac{1}{2}$ % per half year, for 2 yr. 6 mo.;
$1514.299×1.019$\frac{5}{6}$=$1544.332+, amt. for 2 yr. 9 mo. 12 da.;
$1544.331÷1.194$\frac{5}{6}$=$1292.51−, *Ans.*

Ex. 4. There will be 7 interest terms of 3 mo. each, and 1 partial term of 1 mo. 20 da.; hence,
$1840×$(1.02)^7$×1.01$\frac{1}{9}$=$2137.06+, *Ans.*

Ex. 5. 21 yr.—12 yr. 7 mo. 12 da.=8 yr. 4 mo. 18 da.;
$15000×1.733986=$26009.79, amt. for 8 yr.;
697.93, int. for 4 mo. 18 da.;
$26707.72, *Ans.*

Ex. 6 Since $1 will amount to $3.869685, the sum which will amount to $2902.263 in the same time is
$2902.263÷3.869685=$750, *Ans.*

PROBLEMS IN INTEREST.

(**552**, page 325.)

Ex. 1. Int. of $1 for 1 yr. 6 mo. is $.0975;
$279.825÷.0975=$2870, *Ans.*

Ex. 2. Int. of $1 for 6 mo. 24 da. is $.0425;
$63.75÷.0425=$1500, *Ans.*

Ex. 3. Int. of $1 for 10 da. is $.002$\frac{7}{9}$=$$\frac{25}{9000}$;
12\frac{1}{2}$÷$\frac{25}{9000}$=$4500, *Ans.*

Ex. 4. $3125÷.125=$25000, *Ans.*

Ex. 5. $30×12=$360, yearly income;
$360÷.095=$3789.47+, *Ans.*

Ex. 6 Int. of $1 for 6 yr. 5 mo. 11 da. is $.451$\frac{11}{36}$;
$3159.14÷.451$\frac{11}{36}$=$7000, *Ans.*

Ex. 7. The compound interest of $1 for 2 yr. 9 mo. is
$.174162; $69.67÷.174162=$400+, *Ans.*

Ex. 8. The compound interest of $1 for 1 yr. 6 mo. 15 da. is
$.09445; $124.1624÷.09445=$1314.583+, *Ans.*

(**553**, page 326.)

Ex. 1. The amount of $1 for 2 yr. 3 mo. 10 da. is 1.113\frac{8}{9}$;
1893.61\frac{1}{9}$÷1.113$\frac{8}{9}$=$1700, *Ans.*

Ex. 2. The amount of $1 for 3 yr. 5 mo. 12 da. is $1.207;
$681.448÷1.207=$564.58−, *Ans.*

Ex. 3. The amount of $1 for 10 yr. 2 mo. is 1.35\frac{7}{12}$;
$15660÷1.35$\frac{7}{12}$=$11550.09+, *Ans.*

Ex. 4. The amount of $1 for 2 yr. 8 mo. 29 da.
is $1.1923055+;
$1568.97÷1.1923055=$1315.913−, sum at int.;
$1568.97−$1315.913=$253.057+, *Ans.*

Ex. 5. The amount of $1 for 243 da. is $1.054;
$11119.70÷1.054=$10550, sum at interest;
$11119.70−$10550=$569.70, *Ans.*

Ex. 6. The amount of $1 at compound interest for 4 yr. is
$1.262477; $8644.62÷1.262477=$6847.34+.

Ex. 7. Amount of $1 for 10 yr. 5 mo. is $1.835619;
$26772.96÷1.835619=$14585.24+, *Ans.*

(**554**, page 327.)

Ex. 1. \$9.875, interest on \$750 at 1 %;
\$796.875—\$750=\$46.875, whole interest;
\$46.875÷\$9.375=5 %, *Ans.*

Ex. 2. $\$1.32\frac{2}{9}$, interest on \$1700 at 1 %;
$\$10.58\div\$1.32\frac{2}{9}=8+$ %, *Ans.*

Ex. 3. \$57, interest on \$600 at 1 %;
\$856.50—\$600=\$256.50, whole interest;
$\$256.50\div\$57=4\frac{1}{2}$ %, *Ans.*

Ex. 4. \$72.6628, income at 1 %;
$\$744.7937\div\$72.6628=10\frac{1}{4}$ %, *Ans.*

Ex. 5. By investing \$100—\$30=\$70, he will receive annually \$4+\$4=\$8; and $\$8\div\$70=11\frac{3}{7}$ %, *Ans.*

Ex. 6. Since \$100 at 1 % will gain \$4, \$6, \$8, and \$10, in 4, 6, 8 and 10 years respectively, to gain \$100 will
require 100÷ 4=25 %, for 4 years;
$100\div6=16\frac{2}{3}$ %, " 6 "
$100\div8=12\frac{1}{2}$ %, " 8 "
100÷10=10 %, " 10 "

Ex. 7. Since to triple itself the interest must be twice the principal, any sum, as \$100, will triple itself in
2 years, at 200÷ 2=100 %;
5 " " 200÷ 5=40 %;
7 " " $200\div7=28\frac{4}{7}$ %;
12 " " $200\div12=16\frac{2}{3}$ %;
20 " " 200÷20=10 %.

Ex. 8. $\$760.50\div\$7800=9\frac{3}{4}$ %, *Ans.*

Ex. 9 \$223×12=\$2676, yearly income;
$\$2676\div\$35680=7\frac{1}{2}$ %, *Ans.*

(**555**, page 328.)

Ex. 1. $\$273.51\times.07=\$19.1457$, interest for 1 yr.; $\$312.864-\$273.51=\$39.354$, whole interest; $\$39.354\div\$19.1457=2.0555+$ yr. $=2$ yr. 20 da.

Ex. 2. $\$650.82\times.05=\$32.541$, interest for 1 yr.; $\$761.44-\$650.82=\$110.62$, whole interest; $\$110.62\div\$32.541=3.3994+$ yr. $=3$ yr. 4 mo. 24 da., *Ans.*

Ex. 3. Since \$100 at 3 %, 4$\frac{1}{2}$ %, 6 %, 7 % and 10 % will gain \$3, \$4$\frac{1}{2}$, \$6, \$7 and \$10, respectively, in 1 year, a sum will double itself in $100\div3=33\frac{1}{3}$ yr. at 3 %; $100\div4\frac{1}{2}=22\frac{2}{9}$ yr. at 4$\frac{1}{2}$ %; $100\div6=16\frac{2}{3}$ yr. at 6 %; $100\div7=14\frac{2}{7}$ yr. at 7 %; $100\div10=10$ yr. at 10 %.

And quadruple itself in $300\div3=100$ yr. at 3 %; $300\div4\frac{1}{2}=66\frac{2}{3}$ yr. at 4$\frac{1}{2}$ %; $300\div6=50$ yr. at 6 %; $300\div7=42\frac{6}{7}$ yr. at 7 %; $300\div10=30$ yr. at 10 %.

Ex. 4. $\$9750\times.02=\$195$, interest for 1 month; $\$780\div\$195=4$ mo., *Ans.*

Ex. 6. $\$376.76\div333=\$1.131414+$ amt. of \$1; and, referring to the table under 2$\frac{1}{2}$ %, we find that \$1 will amount to this sum (very nearly) in 5 terms of interest, or 2$\frac{1}{2}$ years, *Ans.*

Ex. 7. We find by the table that it will require 11 years for \$1 at 6 % to gain \$.898299; and $\$1-\$.898299=\$.101701$, the interest still to be gained. $\$1.898299\times.06=\$.113898$, int. on last amount for 1 year. $\$.101701\div\$.113898=.8929$ yr. $=10$ mo. 21+da Hence, any sum will double itself at 6 % compound interest, in 11 yr. 10 mo. 21 da.

Again, \$1 at 7 % compound interest will gain

$.967151 in 10 yr.; and $1—$.967151=$.032849, the interest still to be gained; $1.967151×.07 =$.137701 int., of last amount for 1 year; $.032849 ÷$.137701=.23858 yr.=2 mo. 26—da.
Hence, 10 yr. 2 mo. 26 da., *Ans.*

DISCOUNT.

(**557**, page 329.)

Ex. 1. $1.0275, amount of $1 for 5 mo. 15 da.;
$385.3125÷1.0275=$375, *Ans.*

Ex. 2. $1.0826527+, amount of $1 for 1 yr. 6 mo. 1 da.;
$429.986÷1.0826527=$397.160—, present worth;
$429.986—$397.16=$32.826, *Ans.*

Ex. 3. $1.12, amount of $1 for 1 yr. 6 mo.;
$3665.20÷1.12=$3272.50, cash value of sale;
$3272.50—$2964.12=$308.38, *Ans.*

Ex. 4. $12000÷1.05 = $11428.57+
$15000÷1.125 = $13333.33+
Latter offer, $24761.90+, cash value;
$25000—$24761.90=$238.10 gained, *Ans.*

Ex. 5. From Apr. 1, 1860, to Sept. 4, 1860, is 5 mo. 3 da.
" " " " " Jan. 1, 1861, " 9 mo.;
Discounting $1470 for 5 mo. 3 da. at 10 %, and $2816.80 for 9 mo. at 10 %, we have $1470÷1.0425=$1410.07+ borrowed, payable Sept. 4, 1860; $2816.80÷1.075=$2620.28+, borrowed, payable Jan. 1, 1861;

$\$1410.07+2620.28=\$4030.35$, whole loan;
Am't of \$1410.07 @ 7 %, Sept. 4, 1860, \$1452.02
" " 2620.28 " " Jan. 1, 1861, 2757.84

Money borrowed, with interest, \$4209.86
$\$1470+\$2816.80=\$4286.80$, money to be paid, if the house and lot were bought on credit; hence, $\$4286.80-\$4209.86=\$76.94$, gain by borrowing money to pay down.

Ex. 6 $\$576 \div 1.08=\$533.33\frac{1}{3}$
$\$576-\$533.33\frac{1}{3}=\$42.66\frac{2}{3}$, discount;
$\$576 \times .08 = \$46.08$, interest;

Difference, $\$3.41\frac{1}{3}$, *Ans.*

Ex. 7. The term of discount for the first sum is 6 mo. 20 da., and for the second, 11 mo. 14 da.; hence,
$\$243.16 \div 1.039861=\$233.843+$
$\$178.64 \div 1.066888= 167.444+$

$\$401.287+$, *Ans.*

Ex. 8. $\$.09 \times 488 \times 120=\$5270.40$, cost;
$\$5270.40 \div 1.06=\$4972.07+$, pres. worth of note;
$\$6441.60-\$4972.07=\$1469.53-$, *Ans.*

Ex. 9. $\$6.25 \div 1.04=\$6.009+$, present worth of \$6.25;
$\$6.50 \div 1.06= 6.132+$, " " " \$6.50;

Ans. $\$.123\pm$, difference in favor of \$6.25

Ex. 10. 5 % per annum is $3\frac{1}{3}$ % for 8 mo.; hence
$\$6400 \times .03\frac{1}{3}=\$213.33\frac{1}{3}$, discount;
$\$6400-\$213.33\frac{1}{3}=\$6186.66\frac{2}{3}$, to be hired;
$\$6186.66\frac{2}{3} \times .03\frac{1}{3}=\$206.22\frac{2}{9}$, int. on hired money;
$\$213.33\frac{1}{3}-\$206.22\frac{2}{9}=\$7.11\frac{1}{9}$, *Ans.*

(329. 330)

BANKING.

(**576**, page 333.)

Ex. 1. Int. of $1487 at 6 % for 33 da.=$8.18, discount;
$1487—$8.18=$1478.82, proceeds, *Ans.*

Ex. 2 Int. of $384.50 at 7 % for 93 da.=$6.95, discount;
$384.50—$6.95=$377.55, proceeds, *Ans.*

Ex. 3 Int. of $975 at 8 % for 63 da.=$13.65, discount;
$975—$13.65=$961.35, proceeds of note;
$1000—$961.35=$38.65, *Ans.*

Ex. 4. 195 A. 2 R. 25 P.=195.65625 A.;
$27.50×195.65625=$5380.547+, face of note;
int. of $5380.547 at 7 % for 4 mo. 18 da.
=$144.378, discount;
$5380.547—$144.378=$5236.169, *Ans.*

Ex. 5. From Aug. 26 to Nov. 29 is 95 da., the term of discount. Int. of $1962.45 at 7 % for 95 da.= $36.25; $1962.45—$36.25=$1926.20, proceeds.

Ex. 6. Int. of $1066.75 at 6 % for 74 da.=$13.16, disc't;
$1066.75—$13.16=$1053.59, proceeds.

Ex. 7. Note due Aug. $^{20}/_{23}$; term of discount, 49 da.;
int. of $784.72 at 8 % for 49 da.=$8.54, discount,
$784.72—$8.54=$776.18, proceeds.

Ex. 8. Int. of $1845.50 at 24 % for 31 da.=$38.14, disc't;
$1845.50—$38.14=$1807.36, proceeds.

Ex. 9. $950÷ 1.0175=$933.66, true present worth;
$950—$933.66=$16.34, true discount;
$950×.0175 = 16.63, bank discount;

$ .29, *Ans.*

(333, 334)

Ex. 10. \$1375.50÷1.01=\$1361.88, true present worth;
\$1375.50—\$1361.88=\$13.62, true discount;
\$1375.50×.01 = 13.76, bank "
\$ .14, *Ans.*

(**577**, page 334.)

Ex. 1. \$1275÷.9895=\$1288.53—, *Ans.*

Ex. 2. \$5000÷.9845=\$5078.72+, *Ans.*

Ex. 3. The proceeds of \$1 for 3 mo. at 7 % are \$.9825;
\$276.84÷.9825=\$281.77+, *Ans.*

Ex. 4. The proceeds of \$1 for 4 mo. 3 da. at 7$\frac{1}{2}$ % are \$.974375
\$1486.90÷.974375=\$1526+, *Ans.*

Ex. 5. Proceeds of \$1 for 6 mo. 3 da. at 24 %=\$.878;
\$496÷.878=\$564.92, *Ans.*

Ex. 6. Proceeds of \$1 for 33 da. at 5 %=\$.9954166+;
\$1200÷.9954166=\$1205.52+, *Ans.*

Ex. 7. Proceeds of \$1 for 63 da. at 18 %=\$.9685;
\$575=.9685=\$593.70, *Ans.*

Ex. 8. Proceeds of \$1 for 110 da. at 12 %=\$.963$\frac{1}{3}$,
\$187.50÷.963$\frac{1}{3}$=\$194.63+, *Ans.*

(**578**, page 331.)

Ex. 1. Discount of \$100 for 33 da.=\$.55;
\$100—\$.55=\$99.45, proceeds;
interest on proceeds at 1 %=\$.0911625;
\$.55÷.0911625=6$\frac{22}{663}$ %, *Ans.*

Ex. 2. Discount of \$100 for 2 mo. 3 da.=\$4.20;
\$100—\$4.20=\$95.80, proceeds;
interest on proceeds at 1 %=\$.16765;
\$4 20÷\$.16765=25$\frac{25}{479}$ %, *Ans.*

Ex. 3. Discount of \$100 for 93 da.=\$4.65;
\$100—\$4.65=\$95.35, proceeds;
interest on proceeds at 1 %=$\$.24632\frac{1}{12}$;
$\$4.65 \div \$.24632\frac{1}{12} = 18\frac{1674}{1907}$ %, *Ans.*

Ex 4. *Ans.*, $5\frac{5}{23}$ %, $6\frac{6}{19}$ %, $7\frac{49}{113}$ %, $10\frac{10}{11}$ %, $13\frac{1}{3}$ %.

Ex. 5. *Ans.*, $9\frac{5667}{39387}$ %, $12\frac{262}{979}$ %, $25\frac{25}{479}$ %, $81\frac{261}{379}$ %, 38[illegible]

(**579**, page 336.)

Ex. 1.

$\$.45\frac{5}{6}$=int. of \$100 at 5 % for 33 da.;
\$.55 = " " " 6 % " "
$\$.64\frac{1}{6}$= " " " 7 % " "
$\$.91\frac{2}{3}$= " " " 10 % " "

$$\$\frac{100.45\frac{5}{6}\times.0045\frac{5}{6}}{5}=\text{int. at 1 \% of amt. of \$100 at 5 \%;}$$

$$\$\frac{100.55\times.0055}{6}=\text{" " " " " 6 \%;}$$

$$\$\frac{100.64\frac{1}{6}\times.0064\frac{1}{6}}{7}=\text{" " " " " 7 \%;}$$

$$\$\frac{100.91\frac{2}{3}\times.0091\frac{2}{3}}{10}=\text{" " " " " 10 \%;}$$

Hence

$$.45\frac{5}{6}\times\frac{5}{100.45\frac{5}{6}\times.0045\frac{5}{6}}=\frac{5}{1.0045\frac{5}{6}}=4\frac{2356}{2411}\ \%\quad\text{cor. to 5 \%;}$$

$$.55\times\frac{6}{100.55\times.0055}=\frac{6}{1.0055}=5\frac{1945}{2011}\%\quad\text{" " 6 \%;}$$

$$.64\frac{1}{6}\times\frac{7}{100.64\frac{1}{6}\times\ 0064\frac{1}{6}}=\frac{7}{1.0064\frac{1}{6}}=6\frac{11538}{12077}\%\quad\text{" " 7 \%;}$$

$$.91\tfrac{2}{3}\times\frac{10}{100.91\frac{2}{3}\times.0091\frac{2}{3}}=\frac{10}{1.0091\frac{2}{3}}=9\tfrac{901}{1211}\ \%\ \text{cor. to}\ 10\ \%$$

NOTE.—From the solution given above, we see that the result, after cancellation, is obtained, by dividing the given rate by the amount of $1 for the given time.

Ex. 2. $1.0206⅔=amt. of $1 at 8 % for 3 mo. 8 da.;
$.08\div1.0206\frac{2}{3}=7\frac{1283}{1531}$ %, *Ans.*

Ex. 3. 1 % per mo.=12 % per annum;
1½ " " =18 " "
2 " " =24 " "
2½ " " =30 " "
$1.0210=amt. of $1 for 63 da. at 12 %,
$1.0315= " " " " 18 %;
$1.0420= " " " " 24 %;
$1.0525= " " " " 30 %;
$.12\div1.021=11\frac{662}{1021}$ %, to pay 1 % per mo.,
$.18\div1.0315=17\frac{929}{2063}$ %, " " 1½ % " "
$.24\div1.042=23\frac{17}{521}$ %, " " 2 % " "
$.30\div1.0525=28\frac{212}{421}$ %, " " 2½ % " "

Ex. 4. $1.105=amt. of $1 for 18 mo. at 7 %;
$.07\div1.105=6\frac{74}{221}$ %, *Ans.*

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EXCHANGE.

(**599**, page 340.)

Ex. 1. $1.005 — $.0064⅛ = $.9985⅝, cost of exchange for $1;
$5400 × .9985⅝ = $5392.35 +, *Ans.*

Ex. 2. $1 — $.0325 = $.9675, cost of exchange for $1;
$3000 × .9675 = $2902.50, *Ans.*

Ex. 3. **$1.01375 — $.0155 = $.99825, cost exchange for $1;**
$4800 × .99825 = $4791.60, *Ans.*

Ex. 4. $550.62 ÷ 1.035 = $532, *Ans.*

Ex. 5. $1.0175 — $.0064⅛ = $1.0110⅝, cost exchange for $1,
$1324.74 ÷ $1.0110⅝ = $1310.22 —, *Ans.*

Ex. 6. $7500 × .015 = $112.50, commission;
$7500 — $112.50 = $7387.50, net proceeds of sale;
$7387.50 ÷ 1.005 = $7350.75 —, *Ans.*

Ex. 7. $4800 × .005 = $24, discount;
$4800 — $24 = $4776 rec'd per dft. on Baltimore
$4800 ÷ 1.0075 = 4764.27 " " " " Hartford;
$11.73, *Ans.*

Ex. 8. $508.75 ÷ 1.0175 = $500, dividend;
$500 ÷ .0625 = $8000 = 80 shares, *Ans.*

Ex. 9. $5075 — $5000 = $75, premium;
$75 ÷ $5000 = .015 = 1½ %, rate of premium, *Ans*

Revised and adapted to the Act of March 3, 1873.

(**606**, page 346.)

Ex. 1. $\pounds 325\ 3\text{ s. }9\text{ d.}=\pounds 325.1875$;
$\$4.895\times 325.1875=\$1591.79$, *Ans.*

Ex. 2. $\$1\div 5.31\times 6000=\$1129.94$, *Ans.*

Ex. 3. $\$.771\times 1.0025=\$.7729275$, cost of exchange.
$\$.7729275\times 3000=\$2318.78$, cost of bill.
$\$.771-\$.734\div\$.734=.05$; 5%, *Ans.*

Ex. 4. $\$831.12\div\$.205=4054.243$, No. of lire, *Ans.*

Ex. 5. $\$4.855\times 125=\$606.875$, *Ans.*

Ex. 6. $\$7536.30\div\$4.9125=1534.106$, No. of £.
$\pounds 1534.106=\pounds 1534\ 2\text{ s. }1\text{ d.}+$, *Ans.*

Ex. 7. $9087.5\div 2.41=\$3770.746$, *Ans.*

Ex. 8. 4.51 milreis $\times 2500=11275$ milreis, *Ans.*

Ex. 9. $\$1736.10\div 360=\$4.82\frac{1}{4}$, *Ans.*

Ex. 10. $1500\div .9315=1610.30$, cost of ex. in dollars.
$\$1.065\times 1500=\$1597.50$; $\$1610.30-\$1597.50$
$=\$12.80$, *Ans.*

Ex. 11. $25256.8\div 131=192.8$, No. oz. fine gold required;
$480\times 192.8=92544$, No. grains " " "
$92544\div 23.22=3985.53$, value of gold in U. S. coin;
$\$3985.53\times 1.03=\$4105.10$, cost of goods in store.
$\$.198\times 25256.8=\$5000.85$, cost by draft.
$\$5000.85-\$4105.10=\$895.75$, *Ans.*

Ex. 12. 240 d. ÷ 61 d. = 3.93442, No. of oz. fine silver in a £.
480 × 3.93442 = 1888.5216, No. of gr. fine silver in a £.
420 × .9 = 378, No. gr. fine silver in 1 Trade dollar.
1888.5216 ÷ 378 = 4.996, No. Trade dollars, *Ans.*

Ex. 13. $858.85 ÷ 890 = $.9537, *Ans.*

(**608**, page 350.)

Ex. 1. (?) crowns = $5000.
$4.91 = £1.
£1 = 18.5 crowns; (?) = 18792.1 crowns.

Ex. 2. $(?) = 7680 marks.
5.16 fr. = $1.
1 mark = 1.23 fr.; (?) = $1830.69, *Ans.*

Ex. 3. $(?) C. = $750 N. O.
$1 N. O. = $.9875 C.;
(?) = $740.63, proceeds by direct ex.
$(?) C. = $750 N. O.
$1 N. Y. = $1.015 C.
$1 N. O. = $.99 N. Y.
1 = .995.
(?) = $749.87, proceeds by arbitration.
$749.87 — $740.63 = $9.24 gain, *Ans.*

Ex. 4. $.415 × 6000 = $2490, proceeds by draft.
$(?) = 6000 guilders.
11.19 guil. = £1.
£1 = $4.88.
1.0125 = 1; (?) = $2584.31, proceeds by arbitration.
$2584.31 — $2490 = $94.31, *Ans.*

Ex. 5. $4.895=£1.
£1 =24.965 fr.
(?) fr. =$1 ; ?=5.10, course of exchange.

Ex. 6. (?) guilders=$6400.
$4.85 =£1=240 d.
18 d. =1 guilder.
1 =.995.
1.005 =1 ; ?=17419.43 guilders.
$6400÷$.41=15609.75, direct draft.
17419.43 guil.—15609.75 guil.=1809.68 guil., *Ans*

Ex. 7. $5800 × .95=$5510, cost in New Orleans.
$(?) P. =$5510 N. O.
$1 N. Y. =$1.02 P.
$1 N. O. =$.995 N. Y.
1 =1.0025 ; ?=$5606.08, *Ans.*

Ex. 8. 19570÷5.12=3822.26+, cost in dollars, direct.
$(?) =19570 fr.
£1 =$4.89.
25.19 fr. =£1.
1=1.0025 ; ?=$3808.516+, by arbitration.
$3822.26 — $3808.516 = $13.74, gain by arbitration, *Ans.*

Ex. 9. $(?) =£1.
£1 =25.71 fr.
5.155 fr.=$1 ; ?=$4.987, *Ans.*

Ex. 10. £(?) =$3000.
$1 =5.16 fr.
125 fr. =100 m.
1.715 m.=1 guilder.
11.82 g. =£1.
?=£610.9128=£610 18 s. 3 d., am't in bank.
$3000÷$4.915=610.3763, No. £ by direct ex.
£610.3763=£610 7 s. 6 d., difference 10 s. 9 d., gain, *Ans.*

(617, page 353.)

Ex. 1.

$$\begin{array}{rr}
\$500\times30= & \$15000\\
400\times60= & 24000\\
600\times90= & 54000\\
\hline
\$1500 & \$93000
\end{array}$$

$93000\div1500=62$ da., term of credit;
Jan. $1+62$ da. $=$
Mar. 3, 1860, equated time.

Ex 2. $\frac{1}{3}+\frac{1}{4}=\frac{7}{12}$; $1-\frac{7}{12}=\frac{5}{12}$;

$$\begin{array}{rcl}
\frac{1}{3}\times3 & = & 1\\
\frac{1}{4}\times8 & = & 2\\
\frac{5}{12}\times12 & = & 5\\
\hline
1 & & 8
\end{array}$$

$8\div1=8$ mo., *Ans.*

Ex. 3.

$$\begin{array}{rr}
\$480\times90= & \$43200\\
320\times60= & 19200\\
\hline
\$800 & \$62400
\end{array}$$

$62400\div800=78$ da., average term of credit; hence the note for the whole amount will run 365 da.—78 da.$=$287 da. Again,

$480÷1.015=$472.906, present worth of $480;
$320÷ 1.01= 316.831, " " " 320;
$789.737, present worth both debts
Amount of $800 for 287 da.=$838.266
" $789.737 for 1 yr.= 837.121
$ 1.14+, *Ans.*

Ex. 4.

$280×3=$ 840
300×4= 1200 6400÷1340=4 mo. 23 da., average Cr
200×5= 1000 Apr. 1+4 mo. 23 da.=Aug. 24, *Ans.*
560×6= 3360
$1340 $6400

(**618**, page 356.)

Ex. 1.

Due.	Da.	Items.	Prod.
Mar. 4	0	250	
" 25	21	360	7560
Apr. 16	43	96	4128
" 30	57	200	11400
May 17	74	350	25900
		1256	48988

48988÷1256=39 da.; Mar. 4+39 da.= Apr. 12, 1860, *Ans.*

Ex. 2.

Due.	Da.	Items.	Prod.
Oct. 12, 1859	0	180	
Nov. 6, "	25	300	7500
Jan. 15, 1860	95	150	14250
Mar. 19, "	159	350	55650
Feb. 24, "	135	130	17550
Mar. 25, "	165	140	23100
		1250	118050

118050÷1250=94 da.; Oct. 12, 1859 +94 da.= Jan. 14, 1860, *Ans*

Ex. 3.

Due.	Da.	Items.	Prod.
Nov. 30, 1860		240	
Jan. 11, 1861	42	500	21000
Feb. 23, "	85	436	37060
Mar. 17, "	107	325	34775
Apr. 25, "	146	436	63656
May 16, "	167	537	89679
		2474	246170

246170÷2474 =100 da.; Nov. 29, 1860+ 100 da.= Mar. 10, '61, *Ans*

Ex. 4.

Due.	Da.	Items.	Prod.
Aug. 16, 1859		350	
Oct. 15, "	60	250	15000
Dec. 14 "	120	300	36000
Feb. 12 1860	180	248	44640
		1148	95640

95640÷1148=83 da.; Aug. 16, 1859 +83 da.=Nov. 7, 1859, *Ans.*

(**620**, page 360.)

Ex. 2.

Due.	Da.	Items.	Prod.	Due.	Da.	Items.	Prod.
Mar. 1	0	436		May 27	87	400	34800
Apr. 12	42	548	23016	" 9	69	650	44850
July 16	137	812	42744	June 20	111	200	22200
Sept. 14	197	536	105592	Aug. 3	155	84	13020
		1832	171352			1334	114870
		1334	114870				
Balances,		498	56482				

56482÷498=113 da.; Mar. 1, 1860+113 da.=June 22, 1860, due.

Ex. 3.

Focal date.

Due.	Da.	Items.	Int.	Due.	Da.	Items.	Int.
Apr. 1	85	54.36	.77	Apr. 1	85	50.00	.71
" 12	74	28.45	.35	June 18	7	30 00	03
Mar. 16	101	95.75	1.61	" 12	13	125.00	.27
June 25	0	26.32		" 20	5	150.00	.13
		204.88	2.73			355.00	1.14
			1.14			204.88	
	Balances,		1.59			150.12	

Int. on $150.12 for 1 da.=$.02502; $1.59÷$.02502 =64 da.; June 25, 1858+64 da.=Aug. 28, 1859.

Ex. 4.

Due.	Da.	Items.	Int.	Due.	Da.	Items.	Int.
Jan. 1	95	36.72	.58	Jan. 10	86	98.72	1.42
Feb. 1	64	48,25	.51	" 21	75	25.84	.32
Mar. 17	20	72.36	.24	Mar. 23	14	15.17	.04
Apr. 1	5	98.48	.08	Apr. 6	0	8.96	
		255.81	1.41			148.69	1.78
		148.69					1.41
Balance of Items,		107.12		Balance of Int.,			.37

Int. of $107.12 for 1 da. = .018;
$.37÷$.018=20 da., *Ans.*

Ex. 5.

Due.	Da.	Items.	Prod.	Due.	Da.	Items.	Prod.
Apr. 25	24	1000	24000	Apr. 1	0	560	
				" 21	20	324	6480
		1000	24000			884	
		884	6480				
Balances,		116	17520				

17520÷116=151 da.; Apr 1.+151da.=Aug. 30.

Ex. 6.

Due.	Da.	Items.	Prod.	Due.	Da.	Items.	Prod.
Aug. 12	11	684	7524	Aug. 1	0	839	
Oct. 15	75	468	35100				
		1152	42624			839	
		839					
Balances,		313	42624				

42624÷313=136 da.;
Aug. 1.+136 da.=Dec. 15, *Ans.*

Ex. 7.

Due.	Da.	Items.	Prod.	Due.	Da.	Items.	Prod.
Mar. 1	0	500		Apr. 1	31	1000	31000
June 1	92	800	73600				
Aug. 1	153	600	91800				
		1900	165400			1000	31000
		1000	31000				
Balances,		900	134400				

134400÷900=149;
Mar. 1.+149 da.=July 28, *Ans.*

Ex 8.

Due.	Da.	Items.	Prod.
Apr. 12	0	500	
Sept. 20	161	1000	161000
		1500	161000

161000÷1500 = 107 da.; Apr. 12+107 da. = July 28, the average maturity of the two debts Hence to discharge the whole obligation by two equal payments at an interval of 60 da., these payments must be made, one 30 da. *before* July 28, and the other 30 da. *after* July 28; and we have

July 28—30 da.=June 28, date of 1st payment;
July 28+30 da.=Aug. 27, " 2d "

(360, 361)

Ex. 9.

Due.	Da.	Items.	Prod.	Due.	Da.	Items.	Prod.
Sept. 12	0	530.84		Sept. 14	2	436	872
" 20	8	236.48	1892	" 25	13	320	4160
" 30	18	739.56	13312	Oct. 3	21	560	11760
Oct. 5	28	273.44	6289	" 17	35	370	12950
" 6	34	194.78	6623	Nov. 16	65	840	54600
" 29	47	536.42	25212	" 24	73	560	40880
		2511.52	53328			3086	125222
						2511.52	53328
				Balances,		574.48	71894

71894÷574.48=125 da.;

Sept. 12, 1859+125 da.=Jan. 15, 1860, *Ans.*

Ex. 10.

Due.	Da.	Items.	Prod.	Due.	Da.	Items.	Prod.
June 1	0	536.78		June 3	2	500	1000
July 16	45	2156.94	97063	July 1	30	1000	30000
Aug. 12	72	843.75	60750	Nov. 1	153	1500	229500
Sept. 12	103	594.37	61220				
Nov. 18	170	856.48	145602				
		4988.32	364635			3000	260500
		3000.00	260500				
Balances,		1988.32	104135				

104135÷1988.32=52 da.;

June 1+52 da.=July 23, *Ans.*

ACCOUNT SALES.

(**625**, page 362.)

Ex. 1 We first average the sales, using Apr. 1, the earliest maturity of the entire account, for a focal date, thus:

Due.	Da. from Apr. 1.	Items.	Prod.
May 15	44	4368.00	192192
" 5	34	5344.80	181723
June 28	88	3650.00	321200
		13362.80	695115

695115÷13362.80=52 da.;

Apr. 1.+52 da.=May 23, date for commission and guaranty. We now average the entire account, using the same focal date as before, and putting

Freight, Primage, Wharfage and Cartage, as one item; and also, commission and guaranty.

Due.	Da.	Items.	Prod.	Due.	Da.	Items.	Prod.
Apr. 1	0	185.30		May 15	44	43680.00	192192
June 8	63	3207.07	202045	" 5	34	5344.80	181723
June 28	88	37.68	3315	June 28	88	3650.00	321200
May 23	52	443.27	23050				
		3873.32	228410			13362.80	695115
						3878.32	228410
				Balances,		9489.48	466705

466705÷9489.48=49 da.;
Apr. 1+49 da.=May 20, proceeds due.

Ex. 2. Equation for the average of sales.

Due.	Da. from May 1.	Items.	Prod.
June 3	33	1250	41250
" 30	60	2275	136500
July 29	89	2450	218050
Aug. 6	97	300	29100
		6275	424900

424900÷6275=68 da. May 1 +68 da.=July 8, date for commission; \$175.48+\$56.25+\$8.37=\$240.10, charges made May 1, for freight, etc.

Storage on 200 bbl. 5 wk.=storage on 1 bbl. 1000 wk.;
" " 350 " 9 " = " " " 3150 "
" " 400 " 13 " = " " " 5200 "
" " 50 " 14 " = " " " 700 "
10050 wk.

10050×.02=\$201 storage, due Aug. 6;
\$6275×.035=\$219.63 commission, due July 8.

Due.	Da.	Items	Prod.	Due.	Da.	Items.	Prod.
May 1	0	240.10		June 3	33	1250.00	41250
Aug. 6	97	201.00	19497	" 30	60	2275.00	136500
July 8	68	219.62	14935	July 29	89	2450.00	218050
				Aug. 6	97	300.00	29100
		660.72	34422			6275.00	424900
						660.72	34432
				Balances,		5614.28	390468

390468÷5614.28=
70 da.; May 1+70 da.=July 10, proceeds due.

SETTLEMENT OF ACCOUNTS CURRENT.

(**626**, page 364.)

Ex 1.

Due.	Da.	Items. Int.	Cash val.	Due.	Da.	Items. Int.	Cash val.
Jan. 12	140	600.36+11.67	512.03	Jan. 1	151	536.72+13.51	550.23
" 26	126	250.48+ 5.26	255.74	Feb. 3	118	486.57+ 9.57	496.14
Feb 13	108	400.00+ 7.20	407.20	Mar. 26	67	1260.78+14.08	1274.86
Mar 16	77	750.00+ 9.63	759.63	Apr. 20	42	756.36+ 5.29	761.65
Apr. 25	37	200.00+ 1.23	201.23	May 12	20	248 79+ .83	249.62
			2135.83				3332.50

$3332.50—$2135.83=$1196.67, *Ans.*

Ex. 2.

Due.	Da.	Items. Int.	Cash val.	Due.	Da.	Items Int.	Cash value.
Sept. 3	119	478.36+11.07	489.43	Sept. 17	105	96.54+1.97	98.51
Jan. 2	2	256.37-- .10	256.27	" 20	102	200.00+3.97	203.97
" 21	21	375.26-- 1.53	373.73	Oct. 8	89	325.00+5.62	330.62
Feb. 12	43	80.00-- .67	79.33	Nov. 17	44	50.00+ .43	50.43
Dec. 15	16	148.76+ .46	149.22	Dec. 27	4	84.00+ .07	84.07
			1347.98				767.60

$1347.98—$767.60=$580.38, *Ans.*

PARTNERSHIP.

(**629**, page 365.)

Ex. 1 $6470+$3780+$9860=$20110

$20110 : $6470=$7890 : (?)=$2538.453, A's share;

$20110 : $3780=$7890 : (?)=$1483.053, B's "

$20110 : $9860=$7890 : (?)=$3868.493, C's "

Ex. 2. $1847.50—$739=$1108.50, C pays;

$\frac{73900}{184750}=\frac{2}{5}$, B's fraction; $\frac{110850}{184750}=\frac{3}{5}$, C's fraction;

$375×$\frac{2}{5}$=$150, B's gain;

$375×$\frac{3}{5}$=$225, C's "

Ex. 3. \$10000 $\frac{10000}{26000}=\frac{25}{65}$, A's fraction;
12800 $\frac{12800}{26000}=\frac{32}{65}$, B's "
3200 $\frac{3200}{26000}=\frac{8}{65}$, C's "
\$26000
\$9400—(\$1500+\$3400)=\$4500, net profits;
\$4500$\times\frac{25}{65}$=\$1730.77, A's share of net profits;
\$4500$\times\frac{32}{65}$= 2215.38, B's " " "
\$4500$\times\frac{8}{65}$= 553.85, C's " " "
\$553.85+\$1500=\$2053.85, C's whole income.

Ex 4. 115 A. 32 P.=115.2 A.; \$3.75×115.2=\$432, rent;
144+160+192+324=820 sheep;
820 : 144=\$432 : (?)=\$75.86, A pays;
820 : 160=\$432 : (?)=\$84.29, B "
820 : 192=\$432 : (?)=\$101.15, C "
820 : 324=\$432 : (?)=\$170.69, D "

Ex. 5. \$6+\$4+\$2=\$12
\$2640$\times\frac{6}{12}$=\$1320, B's share;
\$2640$\times\frac{4}{12}$= 880, C's "
\$2640$\times\frac{2}{12}$= 440, D's "

Ex. 6. \$6300$\times\frac{1}{7}$=\$900, A's; \$6300$\times\frac{1}{5}$=1260, B's;
\$6300$\times\frac{2}{9}$=\$1400, C's; \$900+\$1400=\$2300, D's
\$6300—(\$900+\$1260+\$1400+\$2300) =\$440 for E and F;
\$440$\times\frac{3}{8}$=\$165, E's; \$440$\times\frac{5}{8}$=\$275, F's.

Ex. 7. $\frac{2}{3}:\frac{5}{6}=\frac{4}{6}:\frac{5}{6}=4:5$; 4+5=9;
\$90$\times\frac{4}{9}$=\$40, share of first;
\$90$\times\frac{5}{9}$= 50, " second.

Ex. 8. If the younger has 8 shares,
the elder will have 9 "
17, sum of shares

$\$5463.80\times\frac{8}{17}=\$2571.20$, the younger receives;
$\$5463.80\times\frac{9}{17}=2892.60$, the elder "

Ex 9. $\$1680-\$840=\$840$, A and B's gain; and since
C's gain is equal to A and B's gains together,
his stock must be $\$12000+\$8000=\$20000$:
$\$840\times\frac{8}{20}=\$336$, A's gain;
$\$840\times\frac{12}{20}=\$504$, B's "

Ex 10. Since the portions of the stock which they severally
put in, are proportioned to their gains respectively,
we have $\$2000+\$2800.75+\$1685.25+\$1014$
$=\$7500$, whole gain;
$\$7500:\$2000=\$22500:(?)=\$6000$, A's stock
$\$7500:\$2800.75=\$22500:(?)\times\$8402.25$, B's "
$\$7500:\$1685.25=\$22500:(?)=\$5055.75$, C's "
$\$7500:\$1014=\$22500:(?)=\$3042$, D's "

Ex. 11. $\frac{1}{6}:\frac{2}{5}:\frac{4}{9}:\frac{1}{3}=\frac{15}{90}:\frac{36}{90}:\frac{40}{90}:\frac{30}{90}=15:36:40:30$
$15+36+40+30=121$, sum of proportional terms;
$\$30000\times\frac{15}{121}=\$3719\frac{1}{121}$, share of 1st;
$\$30000\times\frac{36}{121}=8925\frac{75}{121}$, " " 2d;
$\$30000\times\frac{40}{121}=9917\frac{43}{121}$, " " 3d;
$\$30000\times\frac{30}{121}=7438\frac{2}{121}$, " " 4th.

Ex. 12. $\$71.27+\$142.54=\$213.81$, gain of A and B;
$\$1200-\$500=\$700$, stock of A and B;
$\$700:\$500=\$213.81:(?)=\$152.72\frac{1}{7}$, C's gain;
$\$213.81:\$71.27=\$700:(?)=\$233.33\frac{1}{3}$, A's stock
$\$213.81:\$142.54=\$700:(?)=\$466.66\frac{2}{3}$, B's "

Ex. 13. $3+5+7=15$; $\$18840\times\frac{7}{15}=\$8792$, C's stock;
$\$8792\times\frac{3}{15}=\$1758.40$, A's gain:
$\$8792\times\frac{5}{15}=2930.66\frac{2}{3}$, B's "
$\$8792\times\frac{7}{15}=4102.93\frac{1}{3}$, C's "

(366, 367)

Ex. 14. $\frac{3}{4}$, $\frac{9}{10}$, $\frac{13}{20}=\frac{15}{20}$, $\frac{18}{20}$, $\frac{13}{20}$; and these fractions are proportioned to 15, 18 and 13.

Hence, A and B receive 15 shares,
A " C " 18 "
B " C " 13 "

A, B and C receive $\frac{1}{2}$ of 46=23 shares; and
A will receive 23—13=10 shares,
B " " 23—18= 5 "
C " " 23—15= 8 " . Hence
A has $\frac{10}{23}$ of \$26.45=\$11.50;
B " $\frac{5}{23}$ of \$26.45= 5.75;
C " $\frac{8}{23}$ of \$26.45= 9.20.

(**630**, page 368.)

Ex 1. \$357× 5=\$1785, A's product;
371× 7= 2597, B's "
154×11= 1694, C's "
\$6076
\$6076 : \$1785=\$347.20 : (?)=\$102, A's gain;
\$6076 : \$2597=\$347.20 : (?)=\$148.40, B's "
\$6076 : \$1694=\$347.20 : (?)=\$ 96.80, C's "

Ex 2. 5×12=60 cows for 1 week=A's use of pasture;
4×10=40 " " " =B's " "
6× 8=48 " " " =C's " "
148 " " "
\$55.50×$\frac{60}{148}$=\$22.50, A pays
\$55.50×$\frac{40}{148}$= 15 , B "
\$55.50×$\frac{48}{148}$= 18 , C "

Ex. 3. \$4500—\$1800=\$2700, B's gain;
\$15000×12=\$180000, B's capital for 1 mo.;
\$2700÷180000=\$.015 gain per month on \$1;
\$.015×9=\$.135, gain on \$1 for 9 mo., or C's time;
$\$1800\div.135=\$13333.33\frac{1}{3}$, value of C's land;
$\$13333\frac{1}{3}\div125=\$106\frac{2}{3}$, value of land per acre, *Ans.*

Ex. 4. \$4200×9=\$37800 \$1500× 6=\$ 9000
\$4400×7= 30800 \$1000×10= 10000
A's product, \$68600; B's product, \$19000
\$68600+\$19000=\$87600, sum of products;
\$876 : \$686=\$772.20 : (?)=\$604.71, A's gain;
\$876 : \$190=\$772.20 : (?)=\$167.49, B's "

Ex. 5. 30×12× 9=3240 hours' work by 1st company;
32×15×10=4800 " " " 2d "
28×18×11=5544 " " " 3d "
20×15×12=3600 " " " 4th "
17184 " " " all.
$\$1500\times\frac{3240}{17184}=\$282.82$, wages of 1st company;
$\$1500\times\frac{4800}{17184}=418.99$, " " 2d "
$\$1500\times\frac{5544}{17184}=483.94$, " " 3d "
$\$1500\times\frac{3600}{17184}=314.25$, " " 4th "

Ex. 6. To avoid fractions, suppose A had \$5×6=\$30, and B had \$8×6=\$48. Then
\$30×4=\$120 \$48×4=\$192
\$15×8÷ 120 \$16×8= 128
\$240, A's prod.; \$320, B's prod.;
\$240+\$320=\$560, sum of products;
$\$4000\times\frac{240}{560}=\$1714\frac{2}{7}$, A's,
$\$4000\times\frac{320}{560}=2285\frac{5}{7}$, B's.

Ex. 7. $15800×4=$ 63200
14600×2= 29200
13100×4= 52400
14100×8= 112800 $257600, B's prod.;

$25000×6=$150000
23000×4= 92000
21500×1= 21500
22300×7= 156100 419600, C's prod.;

$30000×7=$210000
31800×3= 95400
26800×8= 214400 519800, D's prod.;

$1197000, sum of products;
$15000× $\frac{2576}{11970}$ =$3228.07, B receives;
$15000× $\frac{4196}{11970}$ = 5258.15, C "
$15000× $\frac{5198}{11970}$ = 6513.78, D "

Ex. 8 C put in $1-(\frac{1}{2}+\frac{2}{5})=\frac{1}{10}$ for 1 year; hence
$\frac{1}{2}×\frac{3}{4}=\frac{3}{8}$, A's product;
$\frac{2}{5}×\frac{1}{2}=\frac{1}{5}$, B's "
$\frac{1}{10}×1=\frac{1}{10}$, C's "
But $\frac{3}{8}$, $\frac{1}{5}$ and $\frac{1}{10}=\frac{15}{40}$, $\frac{8}{40}$ and $\frac{4}{40}$; and these fractions are proportional to 15, 8 and 4; hence
15+8+4=27, sum of proportional terms;
$5400× $\frac{15}{27}$ =$3000, A's share of the gain;
$5400× $\frac{8}{27}$ = 1600, B's " " " "
$5400× $\frac{4}{27}$ = 800, C's " " " "
$5400× $\frac{1}{2}$ = 2700, stock A put in;
$5400× $\frac{2}{5}$ = 2160, " B " "
$5400× $\frac{1}{10}$ = 540, " C " "
$3000+$2700=$5700, A's share of entire stock;
$1600+$2160= 3760, B's " " " "
$800+$540 = 1340, C's " " " "

Ex. 9. $456÷10 =$45.60, A's monthly profit;
$343.20÷8 = 42.90, B's " "
$750÷12 = 62.50, C's " "
Now, their respective amounts of capital must be proportional to their monthly profits; hence
$45.60+$42.90+$62.50=$151;
$151 : $45.60=$14345 : (?)=$4332, A's capital
$151 : $42.90=$14345 : (?)=$4075.50, B's "
$151 : $62.50=$14345 : (?)=$5937.50, C's "

Ex. 10. C will have $1-(\frac{1}{10}+\frac{2}{5})=\frac{1}{2}$ of the profits;
$\frac{1}{10}\div 4=\frac{1}{40}$, B may claim for 1 mo.;
$\frac{1}{2}\div 8=\frac{1}{16}$, C " " " "
$\frac{2}{5}\div 6=\frac{1}{15}$, D " " " " ; hence
$\frac{1}{15}:\frac{1}{40}=\$6000:(?)=\$2250$, B put in;
$\frac{1}{15}:\frac{1}{16}=\$6000:(?)=\$5625$, C " "

Ex 11. $2400—$1920=$480, A's gain;
$2080—$1280= 800, C's "
Now, since the gain varies as the product of the capital and time, we have the compound proportion

$$\left\{\begin{matrix}1920\\6\end{matrix}\right. : \left\{\begin{matrix}1280\\(?)\end{matrix}\right. :: \$480 : \$800$$

$(?)=\frac{1920\times 6\times 800}{1280\times 480}=15$ mo., C's time.
Again, since A gained $480 in 6 mo., he would have gained $480×2=$960 in 12 mo., B's time; and his stock and gain together would have been $1920 +$960=$2880; hence
$2880 : $1920=$4800 : (?)=$3200. B's stock.

ALLIGATION.

(**633**, page 370.)

Ex. 1 $ .60×4=$2.40
.70×3= 2.10
1.10×1= 1.10
1.20×2= 2.40
10) $8.00
Ans. $.80

Ex. 2. $0 ×14=$ 0.00
.75×12= 9.00
.90×24= 21.60
1.10×16= 17.60
66) $48.20
Ans. $.73$\frac{1}{33}$.

Ex. 3. 3 lb. 6 oz.=42 oz.;
4 " 8 " =56 "
3 " 9 " =45 "
2 " 2 " =26 "

23×42= 966 carats;
21×56=1176 "
20×45= 900 "
0×26= 0 "
169) 3042 "
18 carats, *Ans.*

Ex. 4. $1.20×15=$18.00
1.10× 5= 5.50
.90× 5= 4.50
.70×10= 7.00
35) $35.00

worth of 1 bu., $1.00; $1.25—$1=$.25, *Ans.*

Ex. 5. $.05×17=$ .85
.08×51= 4.08
.10×68= 6.80
.12×17= 2.04
153 $13.77

$13.77÷153=$.09, average selling price;
$.09÷1.33$\frac{1}{3}$=$.0675, *Ans.*

Ex. 6. \$2.70×42=\$113.40
2.85×48= 136.80
3.24×65= 210.60

155 \$460.80, cost,
\$460.80×$1\frac{1}{5}$=\$552.96, to be sold for;
\$552.96÷155=\$3.567$\frac{15}{31}$, *Ans.*

Ex. 7. As the degrees and minutes of all the observations are alike, we need to average only the seconds, thus:
25.4″+24.5″+27.8″+26.9″+25.4″+24.7″
+24.2″+26.3″+25.8″+26.7″=257.7″;
257.7″÷10=25.77″. *Ans.* 36° 17′ 25.77″.

Ex. 8. Since the third trial is entitled to twice the degree of reliance to be placed upon either of the others, it is equivalent to two trials giving the same result; hence 37 min. 54.16 sec., 1st trial;
37 " 55.56 " 2d "
37 " 54.82 " 3d "
37 " 54.82 " 3d "

44) 151 min. 39.36 sec.

37 min. 54.84 sec.=9° 28′ 42.6″, *Ans.*

(**634**, page 374.)

Ex. 2.

10	5	$\frac{1}{5}$		3		3
	7		$\frac{1}{3}$		2	2
	12		$\frac{1}{2}$		3	3
	13	$\frac{1}{3}$		5		5

Ans. 3 lb. of the first kind, 2 lb. of the second, 3 lb. of the third, and 5 lb. of the fourth.

Ex. 3.

75	0	$\frac{1}{75}$		40	8
	60		$\frac{1}{15}$	15	3
	90		$\frac{1}{15}$	15	3
	115	$\frac{1}{40}$		75	15

Ans. 8 gal. of water to 3 gal. at \$.60, 3 gal. at \$.90, and 15 gal. at \$1.15

Ex. 4

$62\frac{1}{2}$	40	$\frac{1}{22\frac{1}{2}}$		$17\frac{1}{2}$		$17\frac{1}{2}$	35	7
	60		$\frac{1}{2\frac{1}{2}}$		$17\frac{1}{2}$	$17\frac{1}{2}$	35	7
	80	$\frac{1}{17\frac{1}{2}}$	$\frac{1}{17\frac{1}{2}}$	$22\frac{1}{2}$	$2\frac{1}{2}$	25	50	10

Ans. 7 A. from each of the first two tracts, and 10 A. from the other.

Ex. 5.

45	60	$\frac{1}{15}$			15			15	3
	50		$\frac{1}{5}$	$\frac{1}{5}$		7	3	10	2
	42			$\frac{1}{3}$			5	5	1
	38		$\frac{1}{7}$			5		5	1
	30	$\frac{1}{15}$			15			15	3

Ans. 3 pt. of the first kind, 2 pt. of the second, 1 pt. of the third, 1 pt. of the fourth and 3 pt. of fifth.

Another Solution

45	60	$\frac{1}{15}$			1			1
	50		$\frac{1}{5}$	$\frac{1}{5}$		7	1	8
	42	$\frac{1}{3}$			5			5
	38		$\frac{1}{7}$			5		5
	30			$\frac{1}{15}$			3	3

Ans. 1 pt. of first kind, 8 pt. of second, 5 pt. of third, 5 pt. of fourth and 3 pt. of fifth.

Ex. 6.

$\frac{7}{8}$	$\frac{3}{4}$	8		24	24	3
	$\frac{5}{6}$		24		24	3
	$\frac{9}{10}$	40	40	120	160	20

Ans. 3 lb. at $\frac{3}{4}$ pure, 3 lb. at $\frac{5}{6}$ pure, 20 lb. $\frac{9}{10}$.

NOTE.—In the above solution, we multiply the first ratio, 8 : 40, by 3, making 24 : 120. Then by adding, we get 24 : 24 : 160, which reduced gives 3 : 3 : 20.

(**635**, page 375.)

Ex. 1

58	25	$\frac{1}{33}$		12		4	4
	50		$\frac{1}{8}$		4		4
	62		$\frac{1}{4}$		8		8
	70	$\frac{1}{12}$		33		11	11

NOTE.—Divide the terms in the 3d column by 3, and to the result add the terms in the 4th.

Ans. 4 gal. of the first two kinds, 8 gal. of the third, and 11 gal. of the fourth.

Ex. 2.

10	7	$\frac{1}{3}$		1		5	5
	8		$\frac{1}{2}$		5		5
	13	$\frac{1}{3}$		1		5	5
	15		$\frac{1}{5}$		2		2

NOTE —Multiply the terms in the third column by 5, and add the result to the terms in the fourth column.

Ans. 5, 5, 5, and 2.

Ex. 3. *For the first mixture.*

70	30	$\frac{1}{40}$		3		3	1
	50		$\frac{1}{20}$		3	3	1
	100	$\frac{1}{30}$	$\frac{1}{30}$	4	2	6	2

Ans. 1, 1, and 2.

For the second mixture.

70	30	$\frac{1}{40}$		3			3	1
	50		$\frac{1}{20}$		3	12	12	4
	100	$\frac{1}{30}$	$\frac{1}{30}$	4	2	8	12	4

Ans. 1, 4 and 4.

NOTE.—Multiply the terms in the fourth column by 4, and to the result add the terms in the third column, and then divide by 8.

(**636**, page 376.)

Ex. 1.

22	16	$\frac{1}{6}$			1			1	10
	18		$\frac{1}{4}$			1		1	10
	20			$\frac{1}{2}$			1	1	10
	24	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	3	2	1	6	60

Ans. 10 at \$16, 10 at \$18 and 60 at \$24.

Ex. 2. $\$15 \div 12 = \$1\frac{1}{4}$, price per yard of the ingredient whose quantity is limited.

$1\frac{1}{5}$	$\frac{3}{4}$	$\frac{20}{9}$	$\frac{20}{9}$	1	11	12	4	16
	$1\frac{1}{4}$	20		9		9	3	12
	$1\frac{3}{4}$		$\frac{20}{11}$		9	9	3	12

Ans. 16 yd. at $\$\frac{3}{4}$, and 12 yd. $\$1\frac{3}{4}$

Ex. 3. 9 gal. 2 qt. 1 pt.=77 pt.

$$84\left\{\begin{array}{r|c|c|c|}0 & \frac{1}{84} & 1 & 11\\ 96 & \frac{1}{12} & 7 & 77\end{array}\right.\quad \textit{Ans.}\ 11\ \text{pt.}=1\ \text{gal.}\ 1\ \text{qt.}\ 1\ \text{pt.}$$

Ex. 4.

$$45\left\{\begin{array}{r|c|c||c|c|c|c|c|}30 & \frac{1}{15} & \frac{1}{15} & 2 & 5 & 10 & 15 & 60\\ 55 & \frac{1}{10} & & 3 & & 15 & 15 & 60\\ 70 & & \frac{1}{25} & & 3 & & 3 & 12\end{array}\right.\quad \textit{Ans.}\ 60\ \text{lb.}$$

(637, page 377.)

Ex 1. $2.20×7=$15.40
$2.00×7+ 14.00
14) $29.40
$2.10, average price of the 14 yd.

$$180\left\{\begin{array}{r|c|c||c|c|c|c|c|}160 & \frac{1}{20} & & 3 & & 3 & 1 & 14\\ 175 & & \frac{1}{5} & & 6 & 6 & 2 & 28\\ 210 & \frac{1}{30} & \frac{1}{30} & 2 & 1 & 3 & 1 & 14\end{array}\right.$$

Ans. 14 yd at $1.60, and 28 yd. $1.75

Ex. 2. $1.14×60= $68.40
$1.26×30= 37.80
90) $106.20
$1.18, average price of the 90 gal.

$$157\left\{\begin{array}{r|c|c|c|}118 & \frac{1}{39} & 18 & 90\\ 175 & \frac{1}{18} & 39 & 195\end{array}\right.\quad \textit{Ans.}\ 195\ \text{gal.}$$

Ex. 3. $2.00×40= $80
$ .50×70= 35
110) $115
$ $1\frac{1}{22}$, average price of the 110 bu.

$$1\left\{\begin{array}{r|c|c|c|c|}\frac{1}{4} & \frac{4}{3} & 4 & 2 & 6\frac{2}{3}\\ 1\frac{1}{22} & 22 & 66 & 33 & 110\end{array}\right.\quad \textit{Ans.}\ 6\tfrac{2}{3}\ \text{bu.}$$

NOTE.—Multiply the terms in the fourth column by $\frac{110}{33}=\frac{10}{3}$.

(**638**, page 378.)

Ex. 1.

20	8	$\frac{1}{12}$		1		1	40
	16		$\frac{1}{4}$		1	1	40
	24	$\frac{1}{4}$	$\frac{1}{4}$	3	1	4	160
						6	240

Ans. 40 lb. at 8 cts., 40 lb. at 16 cts., and 160 lb. at 24 cts.

Ex 2. $154÷154=$1, average price.

1	$3\frac{1}{2}$	$\frac{1}{2\frac{1}{2}}$		1		
	$1\frac{1}{3}$		3		1	14
	$\frac{1}{2}$	2	2	5	3	42
					7	98
					11	154

Ans. 14 calves, 42 sheep, and 98 lambs

Ex. 3. $165÷55=$3, average weekly wages.

3	5	$\frac{1}{2}$	$\frac{1}{2}$	5	1	6	30
	1		$\frac{1}{2}$		1	1	5
	$\frac{1}{2}$	$\frac{1}{2\frac{1}{2}}$		4		4	20
						11	55

Ans. 30 men, 5 women, and 20 boys.

INVOLUTION.

(**644**, page 380.)

Ex. 3. *Ans.* 2102500

Ex. 13. *Ans.* 2023.37890625

Ex. 14. *Ans.* 3838.28125

Ex. 16. *Ans.* $1871688\frac{7}{11}$

EVOLUTION.

SQUARE ROOT.

(**657**, page 385.)

Ex. 8. *Ans.* 7502; 24.4315+.

Ex. 9. 99225—63504=35721; $\sqrt{35721}=189$, *Ans.*

Ex. 10. $\sqrt{.126736}=.356$; $\sqrt{.045369}=.213$; .356—.213=.143, *Ans.*

Ex. 11. $\sqrt{\frac{169}{196}}=\frac{\sqrt{169}}{\sqrt{196}}=\frac{13}{14}$; $\sqrt{\frac{7056}{9216}}=\frac{\sqrt{7056}}{\sqrt{9216}}=\frac{84}{96}$;

$\frac{13}{14}\times\frac{84}{96}=\frac{13}{16}$, *Ans.*

Ex. 12. $\sqrt{81^2\times625^2\times2^4}=81\times625\times2^2=202500$, *Ans.*

CONTRACTED METHOD.

(**658**, page 386.)

Ex 1.	5.6568542+, *Ans.*	Ex. 2.	3.4641016+, *Ans*
	32.000000		12.000000
	25		9
106	7.00	64	300
	636		256
1125	6400	686	4440
	5625		4116
11306	77500	6924	28400
	67836		27696

11312	9664	6928	704
	9050		693
1131	614	693	11
	566		7
113	48	7	4
	45		4
11	3		
	2		

Ex. 3.	√57.3322+, *Ans.*	**Ex. 4.**	√.745355+, *Ans.*
	3286.9835	$.\dot{5}=$	.555555+
	25		49
107	786	144	655
	749		576
1143	3798	1485	7955
	3429		7425
1146	369	1490	530
	344		447
115	25	149	83
	23		75
12	2	15	8
	2		8

Ex. 5.	√2.563479+, *Ans.*	**Ex. 6.**	√1.156817+ *Ans.*
$6\frac{4}{7}=$	6.571428+	$1.06^5=$	1.338226±
	4		1
45	257	21	33
	225		21

506	3214
	3036
5123	17828
	15369
5126	2459
	2050
513	409
	359
51	50
	46

225	1282
	1125
2306	15726
	13836
2312	1890
	1850
231	40
	28
23	17
	16

Ex. 7. $1.0125^3 = 1.0380+$
$|1.0188+$, *Ans.*
$\overline{1.0380+}$
1

201	380
	201
202	179
	162
20	17
	16

Ex. 8. $|1.011620\pm$, *Ans*
$\overline{1.023375}$
1

201	0233
	201
2021	3275
	2021
2022	1254
	1213
202	41
	40
20	1

CUBE ROOT.

(**661**, page 392.)

Ex. 9. $\sqrt[3]{134217728}=512$; $\sqrt[3]{512}=8$, *Ans.*

Ex. 10. $39304^2=1544804416$; $\sqrt[3]{1544804416}=1156$, *Ans.*

Ex. 11. $\sqrt[3]{\frac{648}{3000}}=\sqrt[3]{\frac{27}{125}}=\frac{3}{5}$; $\sqrt{\frac{1331}{3179}}=\sqrt{\frac{121}{289}}=\frac{11}{17}$;
$\frac{3}{5}\times\frac{11}{17}=\frac{33}{85}$, *Ans.*

Ex. 12.
$\sqrt[3]{50}=3.6840+$
$\sqrt[3]{31}=3.1413+$
$6.8253+$, sum of cube roots;
$\sqrt[3]{50+31}=\sqrt[3]{81}=4.3267+$, cube root of sum;
$2.4986+$, *Ans.*

CONTRACTED METHOD.

(**622**, page 394.)

Ex. 1.
2.8844992±, *Ans*
24.000000
8

		1200	16000
68	544	1744	13952
		235200	2048000
848	6784	241984	1935872
		248832	112128
864	346	249178	99671
		24952	12457
9	4	24956	9982
		2496	2475
			2246
		250	229
			225
		25	4
			5

Ex. 2. *Ans*, 22.894801384±

			12000.812161
			8
		1200	4000
62	124	1324	2648
		145200	1352812
668	5344	150544	1204352
		15595200	148460161
6849	61641	15656841	140911569
		15718563	7548592
6867	2747	15721310	6288524
		1572406	1260068
69	55	1572461	1257969
		157252	2099
			1573
		1573	526
			472
		157	54
			47
		16.	7
			6

Ex. 3. .555554730±, *Ans.*

			.171467000
			125
		7500	46467
155	775	8275	41375
		907500	5092000
1655	8275	915775	4578875

		924075	513125
1665	833	924908	462454
		92574	50671
17	9	92583	46292
		9259	4379
			3704
		926	675
			648
		93	27
			27
		9	0

Ex. 4. 1.34442±, *Ans.*

			2.429990
			1
		300	1429
33	99	399	1197
		50700	232990
394	1576	52276	209104
		53868	23886
402	161	54029	21612
		5419	2274
4	2	5421	2168
		542	106
			108

Ex. 5. 2.6888±, *Ans.*

			19.440
			8
		1200	11440
66	396	1596	9576

		2028	1864
78	60	2088	1670
		215	194
1	1	216	173
		22	21
			18
		2	3

Ex. 6. .941035±, *Ans.*

$\frac{5}{6}=$ .833333

729

		24300	104333
274	1096	25396	101584
		26508	2749
282	28	26536	2654
		2656	95
			80
		27	15
			14

Ex. 7. .829826686±, *Ans.*

.571428888

512

		19200	59428
242	484	19684	39368
		2017200	20060888
2469	22221	2039421	18354789
		2061723	1706099
2487	1990	2063713	1650970
		206570	55129
25	5	206575	41315

20658	13814
	12395
2066	1419
	1240
207	179
	166
21	13
	13

Ex. 8. 1.057023±, *Ans.*

$1.08674325^2 =$ 1.181011±

			1
		30000	181011
805	1525	31525	157625
		33075	23386
815	221	33296	23307
		3352	79
			67
		34	12
			10

Ex. 9. 1.084715±, *Ans.*

$1.05^5 =$ 1.276282

			1
		30000	276282
808	2464	32464	259712
		34992	16570
824	130	35122	14049
		3525	2521
8	2	3527	2469
		353	52
			35
		35	17
			18

ROOTS OF ANY DEGREE.

(**664**, page 395.)

Ex. 1. $6=3\times2$; $\sqrt[3]{6321363049}=1849$; $\sqrt{1849}=43$, *Ans.*

Ex. 2. $4=2\times2$; $\sqrt{5636405776}=75076$;
$\sqrt{75076}=274$, *Ans.*

Ex. 3. $8=2\times2\times2$; $\sqrt{1099511627776}=1048576$;
$\sqrt{1048576}=1024$; $\sqrt{1024}=32$, *Ans.*

Ex. 4. $6=3\times2$; $\sqrt{25632972850442049}=160103007$;
$\sqrt[3]{160103007}=543$, *Ans.*

Ex. 5. $9=3\times3$; $\sqrt[3]{1.577635}=1.164132+$;
$\sqrt[3]{1.164132}=1.051963+$, *Ans.*

Ex. 6. $12=2\times2\times3$; $\sqrt[3]{16.3939}=2.5404+$;
$\sqrt{2.5404}=1.5938+$; $\sqrt{1.5938}=1.2624+$, *Ans.*

Ex. 7. $18=2\times3\times3$; $\sqrt{104.9617}=10.24508+$;
$\sqrt[3]{10.24508}=2.171893+$;
$\sqrt[3]{2.171893}=1.2950+$, *Ans.*

(**665**, page 397.)

Ex. 2. $\sqrt[4]{120}=3.31+$; $\sqrt[6]{120}=2.22+$;
$3.31+2.22=5.53$; $5.53\div2=2.76$, **assumed root**;
$2.76^4=58.06+$; $120\div58.06=2.0669+$;
$2.76\times4+2.0669=13.1069$;
$13.1069\div5=2.6214$, 1st approximation.
$2.6214^4=47.2203+$; $120\div47.2203=2.54128+$;
$2.6214\times4+2.54128=13.02688$;
$13.02688\div5=2.60537$, 2d approximation.
$2.60537^4=46.07627+$; $120\div46.07627=$

2.604378+; 2.60537×4+2.604378=13.025858; 13.025858÷5=2.605171, 3d approximation, which is correct to the last decimal place.

Ex. 3 $\sqrt[6]{1.95678}=1.11838+$; $\sqrt[8]{1.95678}=1.08292+$;
1.11838+1.08292=2.20130;
2.20130÷2=1.10065, assumed root;

$1.10065^6=1.77785129+$; 1.95678÷1.77785129=1.10064324+; 1.10065×6+1.10064324=7.70454324; 7.70454324÷7=1.10064903, 1st approximation, correct to the last decimal place.

Ex. 4. 10=2×5; $\sqrt{743044}=862$.
Take 4 =the assumed 5th root of 862; then $4^4=256$; 862÷256=3.36; 4×4+3.36=19.36; 19.36÷5=3.872, 1st approximation.

$3.872^4=224.771579$; 862÷224.771579=3.83500443+; 3.872×4+3.83500443=19.32300443; 19.32300443÷5=3.8646008, 2d approximation, *Ans.*

Ex. 5. 15=3×5; $\sqrt[3]{15}=2.466212+$.
Take 1.2=the assumed 5th root of 2.466212; then $1.2^4=2.0736$; 2.466212÷2.0736=1.189339+;
1.2×4+1.189339=5.989339;
5.989339÷5=1.197868, 1st approximation.

$1.197868^4=2.058898+$; 2.466212÷2.058898=1.197831+; 1.197868×4+1.197831=5.989303; 5.989303÷5=1.197861, 2d approximation, correct to the last place; hence *Ans.*, 1.197861+.

Ex 6. Since 25=5×5, we might extract the 5th root of the 5th root, for the 25th root. A more convenient method is as follows:

$\sqrt{100}=10$;

$\sqrt[4]{100}=\sqrt{10}=3.1622+$;

$\sqrt[8]{100}=\sqrt{3.1622}=1.7782+$;

$\sqrt[24]{100}=\sqrt[3]{1.7782}=1.2115+$.

Now, as the 25th root must be less than the 24th root, take 1.2=the assumed root.

$1.2^{24}=79.49684+$; $100\div79.49684=1.25792+$;
$1.2\times24+1.25792=30.05792$;
$30.05792\div25=1.2023168$, 1st approximation.

$1.2023168^{24}=83.2677184+$; $100\div83.2677184=1.2009492+$; $1.2023168\times24+1.2009492=30.0565524$; $30.0565524\div25=1.202262+$, *Ans.*, correct to 5 decimal places.

Ex 7. $\sqrt[4]{5}=1.5+$; $\sqrt[6]{5}=1.3+$; $1.5+1.3=2.8$;
$2.8\div2=1.4$, assumed root

$1.4^4=3.8416$; $5\div3.8416=1.3016+$; $1.4\times4+1.3016=6.9016$;
$6.9016\div5=1.38032$, 1st approximation.

$1.38032^4=3.63011+$; $5\div3.63011=1.37721+$;
$1.38032\times4+1.37721=6.89849$;
$6.89849\div5=1.37970+$, *Ans.*

SERIES.

GENERAL PROBLEMS IN ARITHMETICAL PROGRESSION

(**677**, page 400.)

Ex. 1 $(8-1)\times4=28$; $28+5=33$, *Ans.*

Ex. 2. $(50-1)\times3=147$; $147+2=149$, *Ans.*

Ex. 3. $(13-1)+7=84$; $100-84=16$, *Ans.*

Ex. 4. $(20-1)\times\frac{3}{8}=7\frac{1}{8}$; $7\frac{1}{8}+\frac{2}{3}=7\frac{19}{24}$, *Ans.*

(**678**, page 401.)

Ex. 1. $(15-3)\div(7-1)=2$, *Ans.*

Ex. 2. $(51-1)\div(76-1)=\frac{2}{3}$, *Ans.*

Ex. 3. $.1-.05=.05$; $8-1=7$; $.05\div7=.00\dot{7}14285$, *Ans.*

Ex. 4. $2\frac{1}{2}\div17=\frac{5}{34}$, *Ans.*

(**679**, page 401.)

Ex. 1. $75-5=70$; $70\div5=14$; $14+1=15$, *Ans.*

Ex. 2. $20-\frac{1}{2}=19\frac{1}{2}$; $19\frac{1}{2}\div6\frac{1}{2}=3$; $3+1=4$, *Ans.*

Ex. 3. $2.5-.25=2.25$; $2.25\div.125=18$; $18+1=19$, *Ans.*

Ex. 4. If there are 5 means, there will be $5+2=7$ terms
Hence $37-2=35$; $35\div6=5\frac{5}{6}$, common difference.
Ans. 2, $7\frac{5}{6}$, $13\frac{2}{3}$, $19\frac{1}{2}$, $25\frac{1}{3}$, $31\frac{1}{6}$, 37.

(**680**, page 402.)

Ex. 1. $40-4=36$: $36\div6=6$; $6+1=7$, number of terms;
$(40+4)\times\frac{7}{2}=154$, *Ans.*

Ex. 2 $250\times\frac{1000}{2}=125000$, *Ans.*

Ex. 3. $11=$No. terms; $220=$last term; $17=$com. diff.;
$(11-1)\times17=170$; \$220—\$170=\$50, first term
(\$220+\$50)$\times\frac{11}{2}=$\$1485.

GENERAL PROBLEMS IN GEOMETRICAL PROGRESSION

(**682**, page 403.)

Ex. 1. $6\times4^5=6144$, *Ans.* **Ex. 2.** $192\div2^6=3$, ***Ans.***

Ex. 3. $6\times\frac{1}{3^7}=\frac{2}{3^6}=\frac{2}{729}$, *Ans.*

Ex. 4. $25\times\frac{1}{5^4}=\frac{25}{5^4}=\frac{5^2}{5^4}=\frac{1}{25}$, ***Ans.***,

(**683**, page 404.)

Ex. 1. $512\div2=256$; $\sqrt[4]{256}=4$, ***Ans.***
Ex. 2. $45\frac{9}{16}\div\frac{1}{48}=2187$; $\sqrt[7]{2187}=3$, ***Ans.***
Ex. 3. $7\div.0112=625$; $\sqrt[4]{625}=5$, ***Ans.***
Ex 4. $5000\div8=625$; $\sqrt[4]{625}=5$, ratio;
Ans. 8, 40, 200, 1000, 5000.

(**684**, page 404.)

Ex 1. $1458\div2=729$

$$\begin{array}{r|r}
3 & 729 \\ \cline{2-2}
3 & 243 \\ \cline{2-2}
3 & 81 \\ \cline{2-2}
3 & 27 \\ \cline{2-2}
3 & 9 \\ \cline{2-2}
3 & 3 \\ \cline{2-2}
 & 1
\end{array}\quad \textit{Ans } 7.$$

Ex. 2. $100\div.1=1000$

$$\begin{array}{r|r}
10 & 1000 \\ \cline{2-2}
10 & 100 \\ \cline{2-2}
10 & 10 \\ \cline{2-2}
 & 1
\end{array}\quad \textit{Ans. } 4$$

Ex. 3 $\frac{1}{5}\div\frac{1}{640}=128$

2 | 128
2 | 64
2 | 32
2 | 16
2 | 8
2 | 4
2 | 2
  | 1 *Ans.* 8.

Ex. 4. $196608\div6=32768$

8 | 32768
8 | 4096
8 | 512
8 | 64
8 | 8
  | 1 *Ans.* 6

(**685**, page 405.)

Ex. 1. $384\times2=768$; $768-3=765$; $765\div1=765$, *Ans.*

Ex. 2. $1080\times6=6480$; $6480-5=6475$;
$6475\div5=1295$, *Ans.*

Ex. 3. $4\frac{4}{5}\times3=14\frac{2}{5}$; $14\frac{2}{5}-\frac{8}{405}=14\frac{154}{405}$;
$14\frac{154}{405}\div2=7\frac{77}{405}$, *Ans.*

Ex. 4. The least extreme is 0, and the ratio is $8\div4=2$; hence, $8\times2=16$, *Ans.*

(**686**, page 405.)

Ex. 1. $3^4=81$; $81-1=80$; $80\times7=560$;
$560\div2=280$, *Ans*

Ex. 2. $375\div5^3=3$, least term; $5^4=625$; $625-1=624$;
$624\times3=1872$; $1872\div4=468$, *Ans.*

Ex. 3. $1.06^5=1.338226+$; $175\times.338226=$
59.189550; $59.18955\div.06=986.49+$ *Ans.*

(**687**, page 406.)

Ex. 1. $800-2=798$; $800-686=114$; $798\div114=7$, *Ans*

Ex. 2. $127\frac{3}{4}-\frac{1}{4}=127\frac{1}{2}$; $127\frac{3}{4}-64=63\frac{3}{4}$;
$127\frac{1}{2}\div63\frac{3}{4}=2$, *Ans.*

Ex. 3. $4\frac{1}{2}-0=4\frac{1}{2}$; $4\frac{1}{2}-3=1\frac{1}{2}$; $1\frac{1}{2}\div4\frac{1}{2}=\frac{1}{3}$, *Ans.*

COMPOUND INTEREST BY GEOMETRICAL PROGRESSION.

(**689**, page 407.)

Ex. 1. $\$350$=first term, 5=number of terms, and 1.06=ratio; the last term is required.
$\$350\times1.06^4=\$441.86+$, *Ans.*

Ex. 2. To find the compound interest of \$1, we have $\$1$= first term, 1.07=ratio, 3=No. terms;
$\$1\times1.07^2=\$1.1449$, amount;
$\$1.1449-\$1=\$.1449$, int. of \$1;
$\$150\div.1449=\$1035.196+$, *Ans.*

Ex. 3. We have given $\$1000$=last term, 1.06=ratio, 4= No. terms, to find the first term. Reversing the rule,
$\$1000\div1.06^3=\$839.62-$, *Ans.*

Ex. 4. $\$40$=first term; $\$53.24$=last term; 1.10=ratio. We find the number of terms by Prob. III, thus:
$53.24\div40=1.331$; $1.331\div1.10=1.21$; $1.21\div1.10=1.10$; $1.10\div1.10=1$.
Hence $3+1=4$=No. terms; and *Ans.*, 3 years.

Ex. 5. Let the principal be \$1; then 1=first term; 2=last term; 9=No. terms. We find the ratio by Prob. II, thus: $2\div1=2$; $\sqrt[8]{2}=1.0905+$;
$1.0905-1=.0905=9.05+\ \%$, *Ans.*

Ex. 6. $322.51= last term, 1.05= ratio, 25= No. terms. We find the first term by Prob. I, thus: $1.05^{24}=3.225100+$; $322.51÷3.2251=$100, *Ans.*

ANNUITIES AT SIMPLE INTEREST

(**697**, page 409.)

Ex. 3. $150=the last term; $150×.015=$2.25=common difference; 5½×4=22=No. terms. We find the sum of the series by **677** and **680**, thus: $150+($2.25×21)=$197.25, first term;

$$\frac{\$197.25+\$150}{2}\times 22=\$3819.75,\ \textit{Ans.}$$

Ex. 4. $500=last term, $3450=sum of series, $500×.06=$30=common difference; we are required to find the number of terms. Now 3450÷500=6.9; that is, if the pension did not draw interest, the time required for it to amount to the given sum would be less than 7 yr.; by trial we find the time to be 6 yr.

Ex 5. $6000=last term; $59760=the sum of the series; 8=No of terms. We find the common difference, thus: according to **680**, 2 times the sum of the series=the sum of the extremes multiplied by the number of terms. Therefore

$$\frac{\$59760\times 2}{8}=\$14940,\ \text{the sum of the extremes;}$$

$14940—$6000=$8940, first term. Hence by **678**, $8940—$6000=$2940; $2940÷7=$420, common difference. Then

$420÷$6000=.07=7 %, *Ans.*

PROMISCUOUS EXAMPLES IN SERIES.

(**700**, page 411.)

Ex. 1. Its present amount will be the sum of the geometrical series in which \$200= first term; 1.06= ratio, and 20= No terms. Hence, by **686**,

$$\frac{200\times(1.06^{20}-1)}{1.06-1}=\frac{200\times2.207135+}{.06}=\$7357.11+.$$

Ex. 2. We have given \$16459.35=sum of the series, 25= No. of terms, 1.06=ratio, to find the first term. According to **686**, the sum of the series is equal to the first term multiplied by the fraction $\frac{1.06^{25}-1}{1.06-1}$; consequently the first term will be found by *dividing* the sum of the series by the same fraction; and we have $\$16459.35\times\frac{1.06-1}{1.06^{25}-1}=\frac{\$987.5613}{3.291871}=\$300.$

Ex. 3 We first find the amount of the annuity in arrears for the 7 years. We have given \$500=first term, 1.06=ratio, and 7=No. terms. Hence by **686**,

$$\frac{\$500\times(1.06^{7}-1)}{1.06-1}=\frac{\$251.815}{.06}=\$4196.91\tfrac{2}{3},$$ sum of series. We now find, by **553**, what sum will amount to $\$4196.91\frac{2}{3}$ in 7 years, at 6% compound interest; thus: $\$4196.91\frac{2}{3}\div1.503630=\$2791.18+$.

Ex. 4. We first find the value of the annuity in arrears for the 20 years, or its worth when it expires. We have given \$100=first term, 20=No. terms, and 1.05=ratio, to find the sum of the series. By **686**,

$$\frac{\$100\times(1.05^{20}-1)}{1.05-1}=\$3306.596,\text{ sum of series.}$$

This is what the lease is worth 20+14=34 years hence; therefore its present value, by **553**, is \$3306.596÷5.253348=\$629.426+, *Ans.*

Ex. 5. 21=No. terms, 5=first term, $\frac{1}{4}$=common diff
By **677**, 5—($\frac{1}{4}$×20)=0, last term;
by **680**, $\frac{0+5}{2}\times21=52\frac{1}{2}$, *Ans.*

Ex. 6. 80=last term, 5=common diff., 13=No. terms; to find the first term, and the sum of the series. Reversing the rule under **677**, we have (13—1)×5=60; 80—60=20, first day's journey. Then by **680**, $\frac{80+20}{2}\times13=650$, whole distance traveled.

Ex. 7. 15÷30=$\frac{1}{2}$, the ratio; by **682**, $30\times\frac{1}{2\frac{1}{4}}=\frac{15}{1024}$, *Ans.*

Ex. 8. By **685**, $\frac{(512\times4)-2}{4-1}=\frac{2046}{3}=682$, *Ans.*

Ex. 9. We have given 360=sum of an arithmetical series, 27= first term, and 45= last term, to find the number of terms. By **680**, twice the sum of the series is equal to the sum of the extremes multiplied by the number of terms; conversely, $\frac{360\times2}{27+45}=10$, *Ans*

Ex. 10. By **683**, $\sqrt[6]{15625}=5$, *Ans.*

Ex. 11. \$500=first term, 10= No. terms, 1.06= ratio; to find the sum of the series. By

$$\frac{\$500\times(1.06^{10}-1)}{1.06-1}=\frac{\$395.424}{.06}=\$6590.40,\text{ Ans.}$$

Ex. 12. Reversing the rule under **680**, we have $\frac{408\times2}{8}=102$, the sum of the extremes Now, since 6 is the common difference, and 8 the number of terms, (8—1)

$\times 6=42$ is the difference of the extremes; hence by Prob. 33, **127**, $\frac{102+42}{2}=72$, last term; and $\frac{102-42}{2}=30$, first term.

Ex. 13. We have \$1196= the sum of an arithmetical series, 13=No. of terms, and \$12= the common difference, to find the first and last terms. Proceeding as in the last example, $\frac{\$1196\times 2}{13}=\$184$, the sum of the extremes; $(13-1)\times 12=\$144$, the difference of the extremes. $\frac{\$184-\$144}{2}=\$20$, first payment; $\frac{\$184+\$144}{2}=\$164$, last payment.

Ex. 14. \$2= first term of a geometrical series, \$512= last term, and 4= ratio; to find the number of terms, and the sum of the series.

First, by **684**, $512\div 2=256$; $256\div 4=64$; $64\div 4=16$; $16\div 4=4$; and $4\div 4=1$. Hence $4+1=5$, number of payments.

Second, by **685**, $\frac{(\$512\times 4)-2}{4-1}=\$682$, indebtedness.

Ex. 15. \$4800= first term, 5= No. terms, $1\frac{1}{2}$= ratio; to find the last term, and the sum of the series.

By **682**, $\$4800\times(1\frac{1}{2})^4=\$24300$, share of eldest;

By **685**, $\frac{(\$24300\times 1\frac{1}{2})-\$4800}{1\frac{1}{2}-1}=\$63300$, property

Ex. 16. \$2818.546= sum of series, 5= No. terms, 1.06= ratio; to find the first term. Reversing the rule under **686**, as in Ex. 2, we have

$$\$2818.546\times\frac{1.06-1}{1.06^5-1}=\frac{\$169.11276}{.338226}=\$500, \textit{Ans.}$$

Ex. 17. \$10= first term, \$7290= last term, 3= ratio, to find the number of terms, and the sum of the series

By **684**, $7290\div 10=729$; $729\div 3=243$;

243÷3=81; 81÷3=27; 27÷3=9; 9÷3=3; 3÷3=1; 6+1=7, payments.
By **685**, $\frac{(\$7290\times3)-\$10}{2}=\$10930$, debt.

Ex. 18. If we take the distance traveled in going to the several stations and returning, we shall have an arithmetical series, of which 10 mi.= the first term, 50 mi.=the last term, and 180 mi.=the sum We are to find the number of terms and the common difference. Reversing rule under **680**, we have $\frac{180\times2}{10+50}=6$, No. stations. And reversing rule under **677**, $\frac{50-10}{6-1}=8$, common difference; hence 8÷2 =4 mi., distance between the stations.

Ex. 19. We first find the amount of the annuity in arrears for 12 years, by **686**,

$$\frac{\$200\times(1.06^{12}-1)}{1.06-1}=\$3373.99+\text{, amount.}$$

Since this will be the value of the annuity when it expires, we must find its present worth, at 6% compound interest for 6+12=18 years. By **553**, $3373.99÷2.854339÷$1182.05+, *Ans.*

Ex. 20. We have a geometrical series, in which $6=first term, 1.06=ratio, and 60—16=44=No. terms.

$$\text{Hence, }\frac{\$6\times(1.06^{44}-1)}{1.06-1}=\$1198.548\text{, saved by dispensing with tobacco;}$$

and $1198 544+$500= $1698.548, *Ans.*

Ex. 21. The value of a perpetuity when entered upon, is a sum whose annual interest=the perpetuity; hence, $100 ÷ 05 %=$2000, value when entered upon

Since this is the value 30 years hence, we find its present value by **553**, thus: \$2000÷4.321942=\$462.75+, *Ans.*

Ex. 22. *First;* \$2000 is the amount of a certain sum at simple interest 21—12=9 years at 7%. That is, \$2000 is the last term of an arithmetical series, .07 times the first term is the common difference, and 9+1 is the number of terms; and from these data we are to find the first term. Assuming a series of which \$1 is the first term, \$.07 the common difference, and 10 the number of terms, by **679**, we find the last term to be $\$1+(\$.07\times\overline{10-1})=\$1.63$. Now, since \$1.63 is the last term of an arithmetical series of which \$1 is the first term, \$2000 must be the last term of a similar series, the first term of which is \$2000÷1.63=\$1226.993+, the sum left at 7% simple interest.

Second; \$2000 is the sum of a geometrical series, 1.03 is the ratio, and $(\overline{21-12}\times2)+1=19$ is the number of terms; and we are required to find the first term. By **682**, we have $\$2000\div1.03^{19-1}=$ \$2000÷1.702433=\$1174.789+, the sum left at 6% compound interest payable semi-annually.

Ex 23. The prices of the several pieces form an arithmetical series, of which \$136=sum, \$4=the com. diff., \$31 =the last term, and 8=the No. terms. By **677**, $31-(\overline{8-1}\times4)=3$, first term, or the value of the the first piece; and as the price of this piece was \$1 per yard, \$3÷\$1=3 yards in the first piece. Now, the number of yards in the several pieces form a series, the first term of which is 3, the common difference is 2, and the number of terms is 8. Hence,

$3+2\ (8-1)=17$ yd. in longest piece;

$\frac{17+3}{2}\times 8=80$ " whole quantity.

We now have 3 yd., 5 yd., 7 yd., 9 yd., 11 yd., 13 yd., 15 yd., 17 yd., lengths;

\$3, \$7, \$11, \$15, \$19, \$23, \$27, \$31, prices;

\$1, \$$1\frac{2}{5}$, \$$1\frac{4}{7}$, \$$1\frac{2}{3}$, \$$1\frac{8}{11}$, \$$1\frac{10}{13}$, \$$1\frac{4}{5}$, \$$1\frac{14}{17}$, prices per yard.

Ex. 24 600=sum of series, 2=ratio, and 320=greatest extreme.

First, to find the No. of bushels of the first kind. According to the rule under **685**, the sum of the series multiplied by the ratio less 1, is equal to the difference between the last term multiplied by the ratio and the first term; hence, $600\times(2-1)=600$, difference between the last term multiplied by the ratio, and the first term. Then, $320\times 2=640$; and $640-600=40$ bu. of the first kind.

Next, to find the number of terms.

$320\div 40=8$; $8\div 2=4$; $4\div 2=2$; $2\div 2=1$; hence, $3+1=4$ kinds. *Ans.*

MISCELLANEOUS EXAMPLES.

(**701**, page 414.)

Ex. 1. $18\times 2=36$; $36\times 36=1296$ sq. ft. in both sides of the roof. But 1296 sq. ft.=12.96 squares of 100 ft. each; and since 1000 shingles make 1 square, (282, Note 3), there will be 12.96 M. shingles.

Ex. 2 70 mi.$\times\frac{2}{7}\times\frac{4}{7}\times\frac{1}{3}=3.80952+$ mi.

1 375 mi. $\times .73$ $=1.00375$ mi.

2.80577 mi., *Ans.*

Ex. 3. $91\frac{1}{2} \div \frac{2}{3} = 137\frac{1}{4}$, the whole remainder;
$137\frac{1}{4} + 7\frac{1}{2} = 144\frac{3}{4}$, *Ans.*

Ex. 4. $\dfrac{\frac{4}{9} \times 6}{4} = \dfrac{4}{9} \times \dfrac{6}{1} \times \dfrac{1}{4} = \dfrac{2}{3}$, *Ans.*

Ex. 5. $$50\left\{\begin{array}{r|c|c||c|c|c|}
0 & \frac{1}{50} & & 3 & & 3 \\
10 & & \frac{1}{40} & & 2 & 2 \\
70 & & \frac{1}{20} & & 4 & 4 \\
80 & \frac{1}{30} & & 5 & & 5
\end{array}\right.$$
Ans. 3 gal. of water, of cider, 4 of wine, and 5 of brandy.

Ex. 6. A number increased by $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ of itself, will b $1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}=2\frac{1}{12}$ times the number; hence $125 \div 2\frac{1}{12} = 60$, *Ans.*

Ex. 7. From noon to midnight is 12 hours; and since th time past noon is $\frac{2}{3}$ of the time to midnight, th whole 12 h. must be $1\frac{2}{3}$ times the time to midnight Hence 12 h.$\div 1\frac{2}{3} =$ 7 h. 12 min., time to midnight
12 h.—7 h. 12 min.=4 h. 48 min., P. M , *Ans*.

Ex. 8. $$\begin{array}{rcr}
\$10 \times 12 & = & \$120 \\
8\frac{2}{3} \times 3 & = & 26 \\
7\frac{1}{2} \times 8 & = & 60 \\
\hline
23\,) & & \$206 \\
\hline
 & & \$8\frac{22}{23}
\end{array}$$
$\$8\frac{22}{23}$, *Ans.*

Ex. 9. Int. on \$240 for 4 mo. 26 da., at 1 % = \$.97⅓;
$\$5.84 \div \$.97\frac{1}{3} = 6$ %, *Ans.*

Ex. 10) $$\left\{\begin{array}{c} 24 \\ 189 \\ 10 \end{array}\right. : \left\{\begin{array}{r} 217 \\ 5\frac{1}{2} \\ (?) \end{array}\right. = \left\{\begin{array}{r} 33\frac{3}{4} \\ 2\frac{2}{3} \\ 5\frac{1}{4} \end{array}\right. : \left\{\begin{array}{r} 23\frac{1}{4} \\ 2\frac{1}{3} \\ 3\frac{2}{3} \end{array}\right.$$
$(?) = \frac{24}{1} \times \frac{189}{1} \times \frac{10}{1} \times \frac{1}{217} \times \frac{2}{11} \times \frac{4}{135} \times \frac{3}{8} \times \frac{4}{21} \times \frac{93}{4} \times \frac{7}{3} \times \frac{11}{3} = 16$ h., *Ans.*

Ex. 11 $\$450 \times .05 \times 6\frac{5}{6} = \$153.75$, interest;
$\$450 \div 1.34\frac{1}{6} = \$335.40$, present worth;

$450—$335.40=$114.60, discount;
$153.75—$114.60=$39.15, *Ans.*

Ex. 12. $\$6300\times\frac{8}{7}=\$7200$, elder brother received;
$6300+$7200=$13500, *Ans.*

Ex. 13. $.\dot{7}=\frac{7}{9}$; $.\dot{8}\dot{8}=\frac{88}{99}=\frac{8}{9}$; $.\dot{7}2\dot{7}=\frac{727}{999}$;
$.9\dot{1}32\dot{5}=\frac{91325-9}{99990}=\frac{91316}{99990}=\frac{45658}{49995}$.

Ex. 14. $\$438\times\frac{112\frac{1}{2}}{90}=\$547.50$, *Ans.*

Ex. 15. Int. on $1 for 4 mo. 3 da.=$\$.0239\frac{1}{8}$;
$\$1—\$.0239\frac{1}{8}=\$.9760\frac{5}{8}$, proceeds of $1;
$\$875.50\div.9760\frac{5}{8}=\$896.95+$, *Ans.*

Ex. 16 $228.00÷ 5=$45.60, A's monthly gain;
266.40÷ 8= 33.30, B's "
330.00÷12= 27.50, C's "

$106.40, entire "

$\$2128\times\frac{456}{1064}=\$912$, A's stock;
$2128\times\frac{333}{1064}=666$, B's "
$2128\times\frac{275}{1064}=550$, C's "

Ex. 17 $.35×300=$105, due Oct. 27;
.40×150= 60, " " 31;
.38×500= 190, " Nov. 7;
.42×200= 84, " " 12;
.40×250= 100, " " 25;

Hence, taking Oct. 27 for a focal date,

105× 0= 000
60× 4= 240
190=11=2090 6574÷539=12 da.;
84×16=1344 Oct. 27+12 da.=Nov. 8, *Ans*
100×29=2900
539 6574

Ex. 18. A, B, and C do $\frac{1}{12}$ of it in 1 day;
C does $\frac{1}{24}$ of it, and A $\frac{1}{34}$; hence,
B can do $\frac{1}{12}-(\frac{1}{24}+\frac{1}{34})=\frac{5}{408}$ in 1 day; and
$408\div5=81\frac{3}{5}$ days, *Ans.*

Ex. 19. We here have an arithmetical series, of which 7= the first term, 51= last term, and 4= com. diff.;
by **679**, $\frac{51-7}{4}+1=12$ da., time;
and by **680**, $\frac{51+7}{2}\times12=348$ mi., distance.

Ex. 20. $\$2500\times.0180\frac{5}{6}=\$45.21-$, bank discount;
$\$2500\div1.0175=\$2457.00+$, true present worth;
$\$2500-\$2457=\$43$, true discount;
$\$45.21-\$43=\$2.21$, *Ans.*

Ex. 21. $\$5\div1.035=\$4.830+$, present worth of \$5;
hence this is the better condition by $\$4.875-\$4.83=\$.045$.

Ex. 22. Since, if sold at cost, $\frac{1}{2}$ of the lot should have sold for only $\frac{1}{2}$ of the cost, the gain on $\frac{1}{2}$ was $\frac{5}{8}-\frac{1}{2}=\frac{1}{8}$ of the cost; and $\frac{1}{8}\div\frac{1}{2}=25$ %, *Ans.*

Ex. 23. $\left\{\begin{matrix}\$500\\ \\ 1\text{ yr.}\end{matrix}\right. : \$50=\left\{\begin{matrix}\$960\\ \\ (?)\end{matrix}\right. : \$60$
$(?)=\frac{500\times60}{960\times50}=\frac{5}{8}$ yr. $=7$ mo. 15 da., *Ans.*

Ex. 24. The remainder, which is 88 % of the whole, must be sold for 125 % of the cost of the whole; hence $125\div88=1.42\frac{1}{22}$; $1.42\frac{1}{22}-1=42\frac{1}{22}$ % above cost.

Ex. 25. $\frac{365+.0675}{2}=182.53375$, greater;
$\frac{365-.0675}{2}=182.46625$, less.

Ex. 26. 7 yr. $=84$ mo.; 3 yr. 10mo. 15 da. $=46\frac{1}{2}$ mo.;
$\left\{\begin{matrix}445.625\\84\end{matrix}\right. : \left\{\begin{matrix}650\\46\frac{1}{2}\end{matrix}\right. =128.99 : (?)$
$(?)=\frac{650\times46.5\times128.99}{445.625\times84}=\$104.15+$, *Ans.*

Ex. 27. $\frac{540\times150\times7}{56}=\$10125$, invoice;
$\$10125\times1.26=\$12757.50$, sold for;
$\$12757.50\times.015=\$191.36$, commission;
$\$12757.50-\$191.36=\$12566.14$, net proceeds;
$\$12566.14\div.995=\$12629.28+$, *Ans.*

Ex. 28. $\$.194\times5000=\$970$, draft on Paris;
$5000\div5.20=\$961.53+$, remittance from Paris.

Ex. 29. $\$1000\div.065=\$15384.61+$, stock required;
$\$15384.61\times1.05=\$16153.84$, *Ans.*

Ex. 30. $\$25000\times\frac{70}{120}=\$14583.33\frac{1}{3}$, stock at 8 %;
$\$25000\times.06=\ \ 1500.00$, income of 6 % stock;
$\$14583.33\frac{1}{3}\times.08=\ \ \underline{1166.66\frac{2}{3}}$, " " 8 % "
$\$333.33\frac{1}{3}$, *Ans.*

Ex 31. $\$15190\div.28=\$54250$, money of all.

$$\left.\begin{array}{ll}\text{Suppose A has} & \$1,\\ \text{B will have} & \frac{2}{3}\times\frac{4}{3}=\$\frac{8}{9},\\ \text{C `` ``} & \frac{8}{9}\times\frac{2}{3}\times\frac{5}{3}=\$\frac{80}{81},\end{array}\right\}\text{ proportionate terms.}$$

Multiplying these proportioned terms by 81, we have 81, 72 and 80, the proportional terms of A, B, and C respectively.
$81+72+80=233$, sum of proportional terms;
$\$54250\times\frac{81}{233}=\$18859.44+$, A's money;
$\$54250\times\frac{72}{233}=\ \ 16763.95+$, B's "
$\$54250\times\frac{80}{233}=\ \ 18626.61+$, C's "

Ex. 32. $21-14=7$ payments, or deposits. Now the last deposit will not draw interest; the last but one will draw compound interest for 2 half years, and the amount will be $\$250\times1.03^2$; the last but two will draw compound interest for 4 half years, and the amount will be $\$250\times1.03^4$; and so on. Hence, we have $\$250$=first term, 7=No. terms, and 1.03^2

= the ratio, to find the sum of the series. Now $(1.03^2)^7 = 1.03^{14}$; hence by **686**,

$$\frac{(1.03^{14}-1)\times 250}{1.03^2-1} = \$2104.227+, \textit{ Ans.}$$

Ex. 33. $\frac{3}{4}-\frac{2}{5}=\frac{7}{20}$ cents, profit on 1 peach;
$420 \div \frac{7}{20} = 1200$, *Ans.*

Ex. 34. Since he is to cover 7% of the cost for expenses. and still clear $12\frac{1}{2}$% on the cost, the sales, without allowing for credit or bad debts, must be 100%+ 7%+$12\frac{1}{2}$%=$119\frac{1}{2}$% of the cost. But, since the sales are on credit of 6 mo., the 119.5% is the present worth of the sales; and 119.5×1.03= 123.085%, the % of the cost, which the sales would be, without allowing for bad debts. Now, since 5% of the sales is lost by bad debts, the 123.085% of the cost is 95% of the sales. Hence
123.085÷.95=129.56+%, what the sales must be to cover all conditions; and
129.56—100=29.56+%, *Ans.*

Ex. 35 28×20×10=5600 days' work by 1st;
25×15×12=4500 " " 2d;
18×25×11=4950 " " 3d;
15×24× 8=2880 " " 4th;
17930 " " all.
$\$8600\times\frac{560}{1793}=\$2686.00+$, 1st receives,
$\$8600\times\frac{450}{1793}=$ 2158.39+, 2d "
$\$8600\times\frac{495}{1793}=$ 2374.24+, 3d "
$\$8600\times\frac{288}{1793}=$ 1381.37+, 4th "

Ex. 36. $75\times\frac{500}{100}\times\frac{64}{105}=228\frac{4}{7}$, *Ans.*

Ex. 37. $35.26+int. for 101 da.=$36.15
$48.65+ " " 70 " = 49.50
$ 6.48+ " " 56 " = 6.57
$50.00+ " " 30 " = 50.38

$142.60, *Ans.*

Ex. 38. Had he received $.35 per bushel less for the barley, the whole cost would have been $.35×56=$19.60 less, or $63.10—$19.60=$43.50. But in this case, the prices of barley and corn would be equal. Hence
56+34=90 bu., whole quantity;
$43.50÷90=$.48$\frac{1}{3}$, price of corn;
$.48$\frac{1}{3}$+$.35=$.83$\frac{1}{3}$, " " barley.

Ex. 39. Since $12950 is the proceeds of the note discounted for 6 mo., (allowing 3 days grace), $12950÷.96441666=$13427.81, face of the note received for the flour, Dec. 1.
$13427.81÷ .85=$15797.42, value, Nov. 1;
$15797.42÷1.30= 12151.86, " Oct. 1;
$12151.86÷1.25= 9721.49, paid for flour;
$12950—$9721.49=$3228.51, *Ans.*

Ex. 40. $660÷120=$5.50, mean price;

$$5.50\left\{\begin{array}{l|c|c|c|} 5.75 & \frac{1}{25} & 2 & 80 \\ 5.00 & \frac{1}{50} & 1 & 40 \\ \hline & & 3 & 120 \end{array}\right. \quad \textit{Ans.}\ 80\ \text{bbl.}$$

Ex. 41. From the conditions of the question,
6 da. of 1st+10 da. of 2d=$38;
3 da. of 1st+ 5 da. of 2d=$19;
and 15 da. of 1st+25 da. of 2d=$95.
But 15 da. of 1st+ 8 da. of 2d=$61;
hence 17 da. of 2d=$34;
and 1 da. of 2d=$2.

Now, the 2d mechanic labored 8 da.+10 da.=18 da.
hence, \$2×18=\$36, 2d received;
\$61+\$38—\$36=\$63, 1st "

Ex. 42. \$961.875÷.15=\$6412.50, net value;
\$6412.50÷\$.125=51300 lb., net weight;
180 lb.×.95=171 lb., net weight of 1 box;
51300÷171=300 bags, *Ans.*

Ex. 43. $\sqrt{4900}$=70 lb., *Ans.*

Ex. 44. Had he worked 6 days in each week, he would have received 60×\$2=\$120, and paid for board 10×\$4=\$40, thus saving \$120—\$40=\$80; hence \$80—\$72=\$8, deduction of wages for idle days; and \$8÷\$2=4 da., idle; 60—4=56 da., he worked.

Ex. 45. \$250×1.806111=\$451.528, *Ans.*

Ex. 46. \$120÷100=\$1.20, price per gal. of wine;

$$1.00\left\{\begin{array}{l|c|c|r|}0 & \frac{1}{100} & 1 & 16\frac{2}{3}\\ 1.20 & \frac{1}{20} & 5 & 83\frac{1}{3}\\ \hline & & 6 & 100\end{array}\right. \quad \textit{Ans. } 16\tfrac{2}{3}\text{ gal.}$$

Ex. 47. The quantity of water discharged by a pipe varies as the area of a section of the pipe, and consequently as the square of the diameter. Hence

$$\left\{\begin{array}{l}1\\9\\2\end{array}\right. : \left\{\begin{array}{l}3\\4\\(?)\end{array}\right. = 1 : 3$$

(?)=2 h.$\times\frac{9}{4}\times\frac{1}{3}\times\frac{3}{1}$=4h. 30 min., *Ans.*

Ex. 48. \$4981.50÷1.025=\$4860 to be distributed;
\$4860÷\$8100=.60=60%, *Ans.*

Ex. 49. His asking price was 125% of the cost, and the selling price was 1.25×.86=1.075=107½% of the cost; hence,

$170÷.075=$2266.66$\frac{2}{3}$, cost;
2266.66\frac{2}{3}$+$170=2436.66\frac{2}{3}$, sold for;
2266.66\frac{2}{3}$×1.25=$2833.33$\frac{1}{3}$, asking price.

Ex. 50. 231 cu. in.×2000=462000 cu. in., solid contents;
$\sqrt[3]{462000}$=77.3+in.=6 ft. 5.3 in.+, *Ans.*

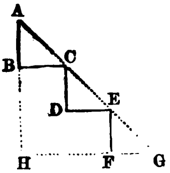
Ex. 51. 21 yr.—13 yr.=8 yr., 1st sum at interest;
21 yr.—15 yr.=6 yr., 2d " "
21 yr.—16$\frac{1}{2}$ yr.=4$\frac{1}{2}$ yr., 3d " "

Now, $.06×8 =$.48, int. of $1 of the first sum
$.06×6 = .36, " " " second "
$.06×4$\frac{1}{2}$= .27, " " " third "

And $\$\frac{1}{1.48}$=present worth of $1 of the first sum,
$\$\frac{1}{1.36}$= " " " " second "
$\$\frac{1}{1.27}$= " " " " third "

Hence, the $5000 must be divided into parts proportional to $\frac{1}{148}$, $\frac{1}{136}$ and $\frac{1}{127}$; or, reducing to a common denominator, and using the numerators (**418**, III), the proportional terms are
17272, 18796, 20128. Then
17272+18796+20128=56196
56196 : 17272=$5000 : (?)=$1536.76+, 1st;
56196 : 18796=$5000 : (?)=$1672.36+, 2d;
56196 : 20128=$5000 : (?)=$1790.88—, 3d.

Ex. 52. Let A B, B C, C D, D E, E F, and F G, represent the distances sailed on the successive days. A G will be the distance the ship departed from A, and A H+H G, or 2 A H, will be equal to the whole distance the ship sailed. Hence A G^2=118.794^2=14112, nearly; 14112÷2=7056=A H^2;
$\sqrt{7056}$=84=A H; 84×2=168 mi., *Ans*



Ex. 53. 4 P. × 110 = 440 gal.;
$2.15 × 440 = $946, first cost;
$946 × .24 = 227.04, duty;
57.60, freight;

$1230.64, whole cost;
$1980 − $1230.64 = $749.36, gain;
$749.36 ÷ $1230.64 = 60.89 + %, *Ans.*

Ex. 54. We form equations, as in Arbitration of Exchange the question being how many bushels of corn [(?) corn] are equal to 5 bbl. of flour.
(?) bu. corn = 5 bbl. flour;
17 bu. wheat = 34.5 bu. corn;
59.5 bu. oats = 9 bu. wheat;
42 lb. flour = 6 bu. oats;
1 bbl. flour = 196 lb. flour;

(?) = $42\frac{282}{289}$, *Ans.*

Ex. 55. 100—8 ÷ 92 %, price of the stock; 92 % : (?) = 10 % : 7 % (?) = $\frac{92\times7}{10}$ = 64.4 %; 100—64.4 = 35.6 % discount, *Ans.*

Ex. 56. £400 × $\frac{40}{9}$ = $$1777\frac{7}{9}$, old par value;
$2000—$$1777\frac{7}{9}$ = $$222\frac{2}{9}$, premium;
$$222\frac{2}{9}$ ÷ $$1777\frac{7}{9}$ = $12\frac{1}{2}$ %, *Ans.*

Ex. 57. 21 mi.—7 mi. = 14 mi., B gains of A daily;
84 ÷ 14 = 6; hence A and B are together every 6 days. 7 mi. + 14 mi. = 21 mi., A and C approach each other daily; 14 mi. + 14 mi. = 28mi., B and C approach each other daily; 84 ÷ 21 = 4; that is, A and C meet every 4 days;
84 ÷ 28 = 3; that is, B and C meet every 3 days;
Now, since A and B meet every 6th day, A and C

every 4th day, and B and C every 3d day, the interval of time required for all to meet, is the least common multiple of 6 da., 4 da. and 3 da.=12 da.

Ex. 58.

		43200
10463	4	41852
9436	7	1348
1027	1	1027
963	3	321
64	5	320

$\frac{10463}{43200}=\frac{1}{4+\frac{1}{7+\frac{1}{1+\frac{1}{3+\frac{1}{5+\text{etc.}}}}}}$

The approximating fractions are $\frac{1}{4}$, $\frac{7}{29}$, $\frac{8}{33}$, $\frac{31}{128}$, and $\frac{163}{673}$.

Hence, there must be a leap year once in four years, 7 times in 28 years, 8 times in 33 years, 31 times in 128 years, or 163 times in 673 years.

Ex. 59. \$14071÷10000=\$1.4071, the amount of \$1 for the time he owned the farm. By reference to the table of Compound Interest, we find that the time in which \$1 at 5% will amount to \$1.4071, is 7 years.

Now, 11 yr.—7 yr.=4 yr., the perpetuity in reversion when he purchased it.

\$14071×.06=\$844.26, the perpetuity which his money would purchase, if it were to be entered upon immediately; and the equivalent perpetuity in reversion 4 years, is the amount of \$844.26 at 6% compound interest, for 4 years. Hence,

\$844.06×1.26247=\$1065.85, *Ans.*

Ex. 60. \$1÷1.035=\$.966=, cash value of \$1;

\$1—\$.966=\$.034, gain on \$.966;

\$.034÷\$.966=.035+, *Ans.*

Ex. 61. The several investments will form a geometrical series, of which the last will be the first term; the last but one multiplied by 1.05, the second term; and so on. Hence 1.05= ratio, 50—21=29= No. terms.

and \$30000 = the sum of the series; we are to find the first term.

Reversing the rule under **686**, we have

$$\frac{\$30000\times(1.05-1)}{1.05^{29}-1}=\frac{\$1500}{3.116136}=\$481.37,\ \textit{Ans.}$$

Ex. 62. The shares of the other two must be as 4 to 5; hence
$4+5=9$;
$\$10000\times\frac{4}{9}=\$4444\frac{4}{9}$, share of 2d;
$\$10000\times\frac{5}{9}=\$5555\frac{5}{9}$, " " 3d.

Ex. 63. (?) hhd. = 1500 bbl.;
50 bbl. = 125 yd.;
80 yd. = 6 bales;
13 bales = $3\frac{1}{2}$ hhd.;

(?) = $75\frac{75}{104}$ hhd., *Ans.*

Ex. 64. $11\frac{1}{4}-5=6\frac{1}{4}$ mi., the 7th gains of the 1st, daily;
$11\frac{1}{4}-6\frac{1}{4}=5$ " " " " 2d "
$11\frac{1}{4}-7\frac{1}{3}=3\frac{11}{12}$ " " " " 3d "
$11\frac{1}{4}-8\frac{1}{4}=3$ " " " " 4th "
$11\frac{1}{4}-9\frac{1}{2}=1\frac{3}{4}$ " " " " 5th "
$11\frac{1}{4}-10\frac{1}{4}=1$ " " " " 6th "

Hence, The 7th will pass the 1st once in $\frac{120}{6\frac{1}{4}}$ da.
" " " 2d " " $\frac{120}{5}$ "
" " " 3d " " $\frac{120}{3\frac{11}{12}}$ "
" " " 4th " " $\frac{120}{3}$ "
" " " 5th " " $\frac{120}{1\frac{3}{4}}$ "
" " " 6th " " $\frac{120}{1}$ "

And the time required for the 7th to pass *all* the others at the same place, will be the least common multiple of the above intervals, which is found by dividing the least common multiple of the numerators by the greatest common divisor of the denominators. Least common multiple of 120=120; Greatest common divisor of $6\frac{1}{4}$, 5, $3\frac{11}{12}$, 3, $1\frac{3}{4}$, and 1 $=\frac{1}{12}$; hence $120\div\frac{1}{12}=1440$ da., *Ans.*

Ex. 65. 1 da.=86400 sec.

86400—20=86380, No. beats 1st makes in 1 da.;
86400+15=86415, " " 2d " " "
$\frac{86400}{86380}=\frac{4320}{4319}$ sec., time in which 1st makes 1 beat;
$\frac{86400}{86415}=\frac{5760}{5761}$ sec., " " " 2d " " "

Now, the least common multiple of $\frac{4320}{4319}$ sec. and $\frac{5760}{5761}$ sec. is $\frac{17280}{7}$ sec., which is the interval of time that must elapse before the two pendulums will beat in unison. But in this time the 1st pendulum will make $\frac{17280}{7}\div\frac{4320}{4319}=2468$ beats; and the 2d pendulum will make $\frac{17280}{7}\div\frac{5760}{5761}=2469$ beats. Therefore, 2468 sec.=41 min. 8 sec. P. M., time by 1st;
2469 sec.=41 min. 9 sec. P. M., " " 2d.

Ex. 66. $$\frac{(3^{30}-1)\times\frac{1}{3}}{3-1}=\frac{3^{30}-1}{6}=343{,}5188682441\tfrac{1}{3}\text{ in.};$$

$343{,}5188682441\frac{1}{3}\div63360=54159073\frac{20221}{4320}$ mi.

Ex. 67. 105 % : 85%=(?) : 6 % (?)$=\frac{105\times6}{85}=7\frac{7}{17}$ %.

Ex. 68. A. P.
6 + 7 =$ .33, 1st condition;
10 + 8 = .44, 2nd "
1st×5=30 +35 =$1.65
2d×3=30 +24 = 1.32
11 =$ .33

$.33÷11= 3 cents, price of one peach;
$.03×7=$.21; $.33—$.21=$.12, price of 6 apples;
$.12÷6=2 cents, price of 1 apple.

Ex. 69 If A has $9
B will have 5
and C will have $\frac{3}{7}$ of $5= $2\frac{1}{7}$
$16\frac{1}{7}$

$\frac{2\frac{1}{7}}{16\frac{1}{7}}=\frac{15}{113}$, C's part of the whole estate,
$3862.50÷$\frac{15}{113}$=$29097.50, *Ans.*

Ex. 70 C. R.
16 +20 =$30, 1st condition;
24 +10 = 27, 2d "
1st×$\frac{3}{2}$=24 +30 =$45
20 = 18
$18÷20 =$.90, price per bu. for rye;
hence, from 1st or 2d, $.75, " " corn.

Ex. 71 For 1 ox worth $28,
there were 2 cows " 34
and 6 sheep " 45
$107

$749×$\frac{28}{107}$=$196, sum paid for oxen
749×$\frac{34}{107}$= 238, " cows;
749×$\frac{45}{107}$= 315, " sheep;
hence, $196÷$28 = 7 oxen,
238÷ 17 =14 cows;
315÷ 7.50=42 sheep.

Ex. 72 $25000÷.76=$32894.73+, *Ans.*

Ex. 73. The difference between the coat and $20, and the coat and $9, is $20—$9=$11, which must be the

ratable wages for 20—12=8 weeks. Hence
$11÷8=$$1\frac{3}{8}$, one week's wages;
$$1\frac{3}{8}$×20=$27.50, wages for 20 weeks;
and $27.50—$20=$7.50, value of coat.

Ex. 74. 540 A. 36 P.=86436 sq. rd.;
$\sqrt{86436}=294$ rd., one side of square piece;
86436÷42=2058 sq. rd., in each of equal square;
$\sqrt{2058}=45.3+$ rd., side of one of equal squares.

Ex. 75. 25 A.=4000 sq. rd.; $\sqrt{4000}=63.245+$ rd., one side of the square field; 63.245 rd.×4=252.980 rd., perimeter of the square field. 4000÷2=2000; $\sqrt{2000}=44.721$ rd., width of the rectangle; 44.721 rd.×2=89.442 rd., length of the rectangle; (44.721 rd., +89.442 rd.) ×2=268.326 rd., perimeter of the rectangle; 268.326 rd.—252.980 rd.=15.346 rd., difference of the perimeters;

$.625×15.346=$9.59+, *Ans.*

Ex. 76. The hour and minute hands start together at 12 o'clock; at 1 o'clock the hour hand has passed over 1 twelfth of the dial, while the minute hand has passed over the whole dial. Therefore, the minute hand gains of the hour hand at the rate of $\frac{11}{12}$ of the dial in 60 min. But, at 5 o'clock the minute hand has $\frac{5}{12}$ of the dial to gain of the hour hand, before passing it. Hence
$\frac{11}{12}:\frac{5}{12}=60$ min. : (?)=27 min. $16\frac{4}{11}$ sec.
Ans. 27 min. $16\frac{4}{11}$ sec. past 5 o'clock.

Ex. 77. It is evident that, to increase the number in both rank and file by 1 man, would require twice the number in rank and file at first, plus 1 (for the man

at the corner). And, since to effect this requires $284+25=309$ men, $\frac{309-1}{2}=154$ is the number of men in rank or file at first.
Hence $154^2+284=24000$, *Ans.*

Ex. 78. 7 = first proportional term,
9 = second " "
$7\times\frac{4}{3}=9\frac{1}{3}$ = third

$25\frac{1}{3}$ = sum of " terms.
$25\frac{1}{3} : 7 = \$3648 : (?) = \$1008$
$25\frac{1}{3} : 9 = \$3648 : (?) = \$1296$
$25\frac{1}{3} : 9\frac{1}{3} = \$3648 : (?) = \$1344$

Ex. 79. 6 A. 132 P. = 1092 P. Then
$13\times21=273$; $1092\div273=4$; $\sqrt{4}=2$;
$13\times2=26$ rd., width; $21\times2=42$ rd, length;
(26 rd. + 42 rd.) $\times 2 = 136$ rd. of fence.

Ex. 80. A, B, C, and D, do $\frac{1}{13}=\frac{7980}{103740}$ of it in 1 day;
A, B, C, and E, " $\frac{1}{15}=\frac{6916}{103740}$ " "
A, B, D, and E, " $\frac{1}{12}=\frac{8645}{103740}$ " "
A, C, D, and E, " $\frac{1}{19}=\frac{5460}{103740}$ " "
B, C, D, and E, " $\frac{1}{14}=\frac{7410}{103740}$ " "
Taking the sum of the fractions, we shall have 4 days' work of each man. Consequently
A, B, C, D, and E do $\frac{36411}{103740}$ of it in 4 days; and
A, B, C, D, and E " $\frac{36411}{414960}$ " 1 day.
Hence, $414960\div36411=11\frac{4813}{12137}$ da. required for all. If, now, from $\frac{36411}{414960}$, the part of the work which all could do in 1 day, we take, successively, the parts which B, C, D, and E; A, C, D, and E, A, B, D, and E; etc., can do in one day, we shall have the parts which A, B, C, D, and E can do, separately, in 1 day, thus:

$\frac{36411}{414960}-\frac{7980}{103740}=\frac{4491}{414960}$, A can do in one day;
$\frac{36411}{414960}-\frac{6916}{103740}=\frac{8747}{414960}$, B " "
$\frac{36411}{414960}-\frac{8645}{103740}=\frac{1931}{414960}$, C " "
$\frac{36411}{414960}-\frac{5460}{103740}=\frac{4571}{414960}$, D " "
$\frac{36411}{414960}-\frac{7410}{103740}=\frac{6771}{414960}$, E " "

Therefore, $414960 \div 4491 = 92\frac{1788}{4491}$ da. req'rd for A;
$414960 \div 8747 = 47\frac{3852}{8747}$ " B;
$414960 \div 1931 = 214\frac{1726}{1931}$ " C;
$414960 \div 4571 = 90\frac{3570}{4571}$ " D;
$414960 \div 6771 = 61\frac{929}{6771}$ " E

Hence B will do the work in the shortest time.

Ex. 81 The first has 1 share;
the second has $1 \times 1\frac{1}{2} = 1\frac{1}{2}$ "
the third has $1\frac{1}{2} \times 1\frac{1}{2} = 2\frac{1}{4}$ "
All have $4\frac{3}{4}$ "

$4\frac{3}{4} : 1 = \$500 : (?) = \$105\frac{5}{19}$, 1st has;
$4\frac{3}{4} : 1\frac{1}{2} = \$500 : (?) = \$157\frac{17}{19}$, 2d "
$4\frac{3}{4} : 2\frac{1}{4} = \$500 : (?) = \$236\frac{16}{19}$, 3d "

Ex. 82. $\$2500 \times 5 = \$12500$ for 1 mo.;
$\$5500 \times 7 = 38500$ " "
B's investments $= \$51000$ " "

$\$1333\frac{1}{3} \div 51000 = \$\frac{4}{153}$, B's (and also A's) gain per month on each \$1 of capital invested.

$\$5000 \times \frac{4}{153} \times 4 = \$522\frac{134}{153}$, A's gain during the first 4 months;

$\$1066\frac{2}{3} - \$522\frac{134}{153} = \$543\frac{121}{153}$, A's gain during the last 8 months;

$\$\frac{4}{153} \times 8 = \$\frac{32}{153}$, gain on \$1 in 8 mo.;

$\$543\frac{121}{153} \div \frac{32}{153} = \$2600$, A's capital for last 8 mo.,

$\$5000 - \$2600 = \$2400$, *Ans.*

Ex. 83. There will be 4 intervals of time each $\frac{1}{2}$ year, and the rate 5 %; hence
$12750÷1.215506=$10489.459–, *Ans.*

Ex. 84. The proceeds of $1 for 93 da. are $$.9819\frac{1}{8}$; and since he sells at 120 % of the purchase price, he realizes 120 %×$.9819\frac{1}{8}$=117.83 % in ready money. Deducting 5 %+2 %=7 % for expenses, we have 117.83 %—7 %=110.83 %, his rate of net receipts on each investment. Hence
$1500 ×1.1083=$1662.45, net proceeds 1st sale;
$1662.45×1.1083= 1842.53+, " " 2d "
$1842.53×1.1083= 2042.07+, " " 3d "
$2042.07×1.1083= 2263.23+, " " 4th "
$2263.23—$1500 = 763.23, whole gain, *Ans.*

Ex. 85. $.80×1.20=$.96, what it must sell for; and since the selling price is 100 %—10 %=90 % of the asking price, we have $.96÷.90=$$1.06\frac{2}{3}$, *Ans.*

Ex. 86. 25×20=500 yd.
$$4\frac{3}{8}$×500=$2187 50, purchase price;
$$4\frac{5}{8}$×500= 2312.50, selling "
$2312.50÷1.02 =$2267.15, cash value of sale;
$2187.50÷1.045= 2093.30, " purchase.
$173.85, *Ans.*

Ex. 87. $1200÷200=6, number of payments;

$$\frac{(1.08^6-1)\times 200}{.08}=\$1437.185,$$

amount of the annuity at the maturity of the last installment. And since this sum will be at compound interest for 10—6=4 years,
$1467.185×1.360489=$1996.07+, *Ans.*

(427, 428)

Ex. 88 The amount of an annuity of $3000 in arrears for 10 years, is $\frac{(1.06^{10}-1)\times\$3000}{.06}=\$39542.40$.

The present worth of this sum, due 10 years hence, is $39542.40÷1.790848=$22080.28, the value of the bequest to the eldest son.

The present value of the same sum due 20 years hence is $39542.40÷3.207136=$12329.51, the value of the bequest to the second son.

The worth of the perpetuity when entered upon by the institution, was $3000÷.06=$50000.

But, as the perpetuity is not to be entered upon till 20 years after the man's decease, its present value is $50000÷3.207136=$15590.23.

Ex 89. It requires 5+1=6 days for the horse team to perform the trip and rest a day, 7+1=8 days for the mule team, and 11+1=12 days for the ox team to do the same. Now, the least common multiple of 6 da., 8 da. and 12 da is 24 da. Therefore the three teams will rest together on the 24th day, and consequently 24—1=23 da. must elapse before this day comes.

Ex 90. The four payments must be treated according to the U. S. rule for Partial Payments; that is, the payment each year will cancel the interest which has accrued on the principal for that year, together with a certain portion, or *installment*, of the principal itself. Now, the principal for the second year will be less than the principal for the first year, by the value of the first installment; and consequently the interest to be canceled by the second payment will be *less* than the interest canceled by the first payment by one year's, interest, or 6 %, of the first installment. Hence the second installment will *exceed* the first, by the same sum; that is, the second installment will be 1.06 times the first. For a similar reason, the third will be 1.06 times the second; and so on. Therefore, these installments of the principal form a geometrical series, of which the 1st installment = first term, 4= No. terms, and \$4500= sum of the series. We may find the first term by reversing the rule under **715**, thus:

$$\frac{(1.06-1)\times\$4500}{1.06^4-1}=\$1028.67+=\text{ 1st term, or that}$$

part of the principal canceled by the first payment But the payment must also cancel the interest of the principal for that year, which is $\$4500\times.06=\$270$; hence $\$1028.67+\$270=\$1298.67$, *Ans.*

Ex. 91 Of the payments coming due after Jan. 1, 1864, one is to be discounted for 2 half years at 6 % per annum, or for 2 intervals at 3 %; and the other for 4 intervals at 3%. Hence

\$1050, 4th payment;
$\$1050\div1.0609=\$$ 989.725+, present val. 5th pay't.
$\$1050\div1.125509=$ 932.911+, " 6th "

\$2972.636+, *Ans.*

Ex. 92. $2\times3=6$; $864\div6=144$; $\sqrt{144}=12$;
$3\times12=36$, No. of rows;
$2\times12=24$ " trees in each row.

And since the spaces between the trees are 1 less each way, than the number of trees,

(36—1)×7=245 yd., length of the orchard;
(24—1)×7=161 yd., breadth " "
245×161=39445 sq. yd., *Ans.*

Ex. 93 $2500×1.06=$2650, first cost;
$2650×1.225043= $3246.36, amount for 3 yr.;
$3246.36×1.0175= 3303.17, " 3 yr. 3 mo,
which is to be considered as the whole cost of the investment.

Now, there were received 6 dividends of $100 each, received 2 yr. 9 mo., 2 yr. 3 mo., 1 yr. 9 mo., 1 yr. 3 mo., 9 mo., and 3 mo., respectively, before the sale of the stock. Hence, reckoning compound interest,

Amt. of	$100 for	2 yr.	9 mo.=	$120.50
"	"	2 "	3 " =	116.49
"	"	1 "	9 " =	112.62
"	"	1 "	3 " =	108.87
"	"		9 " =	105.25
"	"		3 " =	101.75
			Value of dividends,	$ 665.48
			Sale of stock, $2500×1.11=	2775.00
			Whole sum realized,	$3440.48

$3440.48—$3303.17=$137.31, *Ans.*

MENSURATION.

(**729,** page 423.)

2. $30 \times 40 \div 2 = 600$; area, 600 sq. ft., *Ans.*
3. $12.5 \times 6.75 \div 2 = 42.1875$; $42\frac{3}{16}$ sq. ft., *Ans.*
4. $25.01 \times 18.14 \div 2 = 226.84$; 22 A. 6 ch. 13.45 P., *Ans.*
5. $\$60 \times (15.48 \times 9.67 \div 2 \div 10) = \$449.07$.
6. $\$.40 \times \overline{35 \times 21 \div 2} = \$147$, *Ans.*
7. $28 \times 15 \div 2 = 210$; 210 sq. ft., *Ans.*

(**730,** page 424.)

2. $20\frac{1}{4} \times 2 \div 9 = 4.5$; $4\frac{1}{2}$ ft., *Ans.*
3. $65 \times 2 \div 10 = 13$; 13 in., *Ans.*
4. $588 \times 2 \div 42 = 28$; 28rd., *Ans.*
5. $30\frac{1}{4} \times 160 \times 6\frac{1}{2} \times 2 \div 17 = 3701\frac{3}{17}$; $3701\frac{3}{17}$ yd.$=$ 672 rd. $5\frac{3}{17}$ yd., *Ans.*
6. 5 A. 33 P.$=$833 P.; 12.25 ch.$=$49 rd.
   $833 \times 2 \div 49 = 34$; 34 rd.$=8\frac{1}{2}$ ch., *Ans.*
7. $\$1050 \div \$5.25 = 200$; $200 \times 2 \div 8 = 50$; 50 rd., *Ans.*

(**731,** page 424.)

2. $\dfrac{20 + 15 + 15}{2} = 25$; $25 - 20 = 5$; $25 - 15 = 10$.

   $\sqrt{25 \times 5 \times 10 \times 10} = 111.85$; 111.85 sq. ft., *Ans.*
3. Half sum$=105$; $105 - 70 = 35$.

   $\sqrt{105 \times 35 \times 35 \times 35} \div 160 = 13.26$; 13.26 A.; 13 A. 41.76 P., *Ans.*
4. Half sum$=34$; $34 - 30 = 4$; $34 - 20 = 14$; $34 - 18 = 16$.

   $\sqrt{34 \times 4 \times 14 \times 16} \times 2 = 349.07$; 349.07 sq. ft., *Ans.*

(**733**, page 425.)

2. $\sqrt{36^2+15^2}=39$; 39 ft., *Ans.*
3. $\sqrt{20^2+16^2}=25.6$; 25 ft. 7 in.+, *Ans.*
4. $\sqrt{25^2+23^2}=33.97$; 33.97 ch.+, *Ans.*
5. $\sqrt{20^2+16^2+12^2}=28.28$; 28.28 ft., 28 ft. 3.36 in., *Ans.*

   $\sqrt{20^2+16^2}$=distance from corner to corner on the floor. This is now taken as the base of a new triangle, whose altitude is 12.

(**734**, page 426.)

2. $\sqrt{53^2-28^2}=45$; 45 yd., *Ans.*
3. $\sqrt{380^2-120^2}=360.5$; 360 ft. 6 in.+, *Ans.*
4. $\sqrt{52^2-48^2}=20$; 20 ft., *Ans.*

(**745**, page 427.)

2. $10.5\times 8=84$; 84 sq. ft., *Ans.*
3. $8.75\times 6\div 10=5\frac{1}{4}$; 5¼ A., *Ans.*

(**746**, page 427.)

2. $\overline{178+146}\div 2\times 69=11178$; 11178 sq. ft., *Ans.*
3. $\overline{18+25}\div 2\times 16\div 12=28\frac{2}{3}$; 28⅔ sq. ft., *Ans.*
4. $\overline{38+26}\div 2\times 10\div 160=2$; 2 A., *Ans.*

(**747**, page 428.)

2. $\overline{9+12.5}\div 2\times 35.5=381.625$; 381⅝ sq. ft., *Ans.*
3. $(20.453+50.832)\div 2\times 80\div 160=17.82125$; 17 A 131.4 P., *Ans.*

(**751.** page 429.)

2. 5.5 ft. $\times 3.1416 = 17.2788$ ft. $= 17$ ft. 3 in., *Ans.*

4. 50 ft. $\div 3.1416 = 15.9+$ ft. $= 15$ ft. 10.98 in., *Ans.*

5. 18.5 ft. $\div 3.1416 = 5.88+$ ft. $= 5$ ft. 10.6 in., *Ans.*

6. 7.75 ft. $\times 3.1416 = 24.3474$ ft. $= 24$ ft. 4 in., *Ans.*

7. 8.5 ft. $\times 3.1416 = 26.7+$ ft. $= 26$ ft. 8 in., *Ans.*

8. 31.416 ft. $\div 3.1416 \div 2 = 5$ ft., *Ans.*

9. 10 ft. $\times 2 \times 3.1416 = 62.832$ ft., *Ans.*

10. 14 in. $\times 2 \times 3.1416 = 87.96$ in. $= 7$ ft. 3.96 in., *Ans.*

(**752**, page 429.)

4. 200 ch. $\times \left(\overline{200 \div 3.1416} \div 4\right) \div 10 = 318.3$; 318.3 A., *Ans.*

5. 480 rd. $\times \left(\overline{480 \div 3.1416} \div 4\right) \div 160 = 114.59$ A., *Ans.*

6. $\overline{20 \times 2}^2 \times .7854 = 1256.64$; 1256.64 sq. in.; 8 sq. ft. 104.64 sq. in., *Ans.*

(**753**, page 430.)

3. $\sqrt{38.4846 \div .7854} = 7$; 7 rd., *Ans.*

4. $\sqrt{286.488 \div .7854} = 19.09$, diameter.
19.09 ft. $\times 3.1416 = 59.97$ ft., circumference.

(**754**, page 430.)

2. $\sqrt{200^2 \div 2} = 141.42$; 141.42 ft., *Ans.*

3. $104 \div 3.1416 \times .7071 = 23.4+$; 23.4 yd., *Ans.*

(**755**, page. 431.)

2. $\overline{7.75 + 4.25} \times \overline{7.75 - 4.25} \times .7854 = 32.98$; 32.98 sq. ft., *Ans.*

3. $(35.75 + 16.25) \times (35.75 - 16.25) \times .7854 = 796.39$; 796.39 sq. ft., *Ans.*

4. 1 A. 154.16 P. = 314.16 P.; $\sqrt{314.16 \div .7854} = 20$, diameter.

$\overline{20+10} \times \overline{20-10} \times .7854 = 235.62$ P., area of L.
314.16 sq. rd. — 235.62 sq. rd. = 78.54 P., area of W. } *A.*

(756, page 431.)

2. $\sqrt{36 \times 81} = 54$, *Ans.*
3. $\sqrt{42 \times 168} = 84$, *Ans.*
4. $\sqrt{64 \times 12.25} = 28$, *Ans.*
5. $\sqrt{8 \times 288} = 48$, *Ans.*
6. $\sqrt{\frac{36}{49} \times \frac{4}{8}} = \frac{12}{63} = \frac{4}{21}$, *Ans.*
7. $\sqrt{\frac{25}{64} \times \frac{100}{144}} = \frac{25}{48}$, *Ans.*
8. $\sqrt{36 \times 30} = 32.86$; 32.86 lb., *Ans.*

(757, page 432.)

5. $3 : 45387 :: 3^2 : x^2$; $x = 369$ rd. long, *Ans.*
$3 : 45387 :: 1^2 : x^2$; $x = 123$ rd. wide, *Ans.*

6. $55.1 : 300 :: 1.5^2 : x^2$; $x = 3.5$ in., *Ans.*

7. The area of a triangle whose sides are 13, 14, and 15 ft. is 84 sq. ft.

$84 : 24276 :: 13^2 : x^2$; $x = 221$ ft.
$84 : 24276 :: 14^2 : x^2$; $x = 238$ ft. } . *Ans.*
$84 : 24276 :: 15^2 : x^2$; $x = 255$ ft.

8. $240^2 : 1^2 :: 37635840$ in. : x in.; $x = 653.4$, *Ans.*

9. The cost to inclose depends upon the circumference. We then consider the cost as a representative of the circumference.

$1 : \frac{1}{5} :: 167.7^2 : x^2$; 1 = \$75, *Ans.*

10. $80 : 1200 :: 6^2 : x^2$; $x = 23.2$ ft., *Ans.*

11. 2 A. : 8 A. :: 63.39^2 rd. : x^2 rd.; $x = 126.78$ rd., *Ans.*

(758, page 433.)

1. $270\times 3\times 2\div 45=36$; 36 ft., *Ans.*

2. $(48+48+28+28)\div 4=38$; $38^2=1444$; 1444 sq. ft., *Ans.*

3. $3 : 1323 :: 1^2 : x^2$; $x=21$.
$3 : 1323 :: 3^2 : x^2$; $x=63$; 21 rd. by 63 rd., *Ans.*

4. $\sqrt{36^2-18^2}\times 18=561$; 561 sq. ft., *Ans.*

5. $\sqrt{7569}=87$; 87 ft., *Ans.*

6. 20 A.$=3200$ sq. rd.; $\sqrt{3200}\times 4=226.274+$, perimeter of square; $\$2.40\times 226.274=\$543.16$, cost.
$\frac{1}{5} : 3200 :: 1^2 : x^2$; $x=126.491=$length in rods.
$\frac{1}{5} : 3200 :: (\frac{1}{5})^2 : x^2$; $x=25.298$, width in rods.
$126.491+126.491+25.298+25.298=303.578$, perimeter of rectangle.
$\$2.40\times 303.6=\$728.59$, cost for rectangle.
$\$728.59-\$543.16=\$185.43$, *Ans.*

7. $\sqrt{25^2+20^2+15^2}=35.35$ ft., *Ans.*

8. $\sqrt{20^2+15^2}=25$; 25 ft., *Ans.*

9. $\sqrt{25^2+15^2}=29.15+$; 29.15 ft., *Ans.*

10. $1\frac{1}{4}$ sq. m.$=128000$ sq. rds.
$\sqrt{128000\div .7854}=403.7$; 403.7 rd., *Ans.*

11. 5 A.$=800$ sq. rd.; $\sqrt{800}\times 4=113.12$, No. of rods in perimeter of square.
$\sqrt{800\div .7854}\times 3.1416=100.25$, No. of rd. in circum.
113.12 rd.$-$100.25 rd.$=$12.87 rd., *Ans.*

12. $\$75\times\left(\overline{40+22}\div 2\times 25\right)\div 10=\$5812.50$, *Ans.*

13. $20^2-(20^2\times .7854)=85.84$; 85.54 sq. ft., *Ans.*

14. The altitude of this rhombus is that of a right-angled triangle whose hypothenuse is 15 ft. and base 9 ft. or 12 ft.; $\$.18\times\overline{15\times12}=\$32.40$, *Ans.*

15. $\sqrt{50^2-4^2}=49.839=$ radius; diameter $=99.678$ ft.
99.678 ft. $\times 3.1416=313.14$ ft. $=$ circumference.
$99.678\times313.14\div4=7803.79$; 7803.79 sq. ft. $=$ 28.66 P., area.

16. $40^2-\left(\sqrt{40^2\div2}\right)^2=800$; 800 sq. rd. $=5$ A., *Ans.*

17. Half sum of sides $=71$; $71-40=31$; $71-48=23$; $71-54=17$: $\sqrt{71\times31\times23\times17}=927.68$.
$\$125\times\overline{927.68\div160}=\$724.75$, *Ans.*

18. $1:4::10^2:x^2$; $x=20$; 20 ft., *Ans.*

19. $36^2\times.7854-\left(\sqrt{36^2\div2}\right)^2=369.8784$; 369.8784 sq. ft., *Ans.*

20. $200^2\times.7854\div2=15708$; 15708 sq. rd. $=98$ A. 28 rd., *Ans.*

21. $2:1::100^2:x^2$; $x=70.71$, side of garden inside the walk in rods.
100 rd. $-$ 70.71 rd. $\div2=14.645$ rd., *Ans.*

22. 540 A. 36 P. $=86436$ sq. rd.; $\sqrt{86436}=294$; 294 rd.
$\sqrt{86436\div42}=45.36$ rd., *Ans.*

23. 15 A. $=2400$ P.; $2400\div30=80$; 80 rd., length.
80 rd. $=1320$ ft.; $\sqrt{1320^2-120^2}=1314.5$ ft.;
1314.5 ft. $=79.68$ rd.; $79.68\times30\div160=14.9$ A., *Ans.*

24. $12:48::3^2:x^2$; $x=6$; 6 in., *Ans.*

(**765**, page 436.)

4. $6\times3.1416\times8+(6^2\times.7854\times2)=207.3456$; 207.34 sq. ft., *Ans.*

5. $(4\frac{2}{3}+4\frac{2}{3}+3\frac{1}{4}+3\frac{1}{4})\times8\frac{3}{4}+(4\frac{2}{3}\times3\frac{1}{4}\times2)=168\frac{7}{8}$; $168\frac{7}{8}$ sq. ft., *Ans.*

6. $(4\times2\times3.1416\times6.5)+\left(\overline{4\times2}^2\times.7854\times2\right)=263.8944$; $263.89+$ sq. ft., *Ans.*

7. $15\times18+\left(\frac{1}{2}\sqrt{6^2-3^2}\times6\times2\right)=301.176$; 301.176 sq. ft., *Ans.*

(**766**, page 437.)

3. $9.8\times7.5\times5.25=385.875$; 385.875 cu. ft., *Ans.*

4. $\overline{1.5}^2\times.7854\times18=31.8+$; 31.8 cu. ft., *Ans.*

5. $6.5\times6.5\times6.5=274.625$; $274\frac{5}{8}$ cu. ft., *Ans.*

6. $\$.30\times1.5\times1.5\times40=\$27$, *Ans.*

7. $\overline{2.5}^2\times.7854\times15=73.63+$, *Ans.*

(**775**, page 438.)

3. $8.5\times4\times10.5+\overline{8.5\times8.5}=429.25$; 429.25 sq. ft., *Ans.*

4. $6.75\times3.1416\times22.5+\left(\overline{6.75}^2\times.7854\right)=512.9+$; 512.9 sq. ft., *Ans.*

5. $\$.25\times(5\times6\times30\div9)=\$25$, *Ans.*

(**776**, page 439.)

3. $\overline{2.5}^2\times.7854\times8=39.27$; 39.27 cu. ft., *Ans.*

4. Area of base $=3.899$ sq. ft.
$\$2.50\times3.897\times9\div3=\$29.23$, *Ans.*

5. $\sqrt{130^2-(40^2+30^2)}=120$, altitude of pyramid.
$\sqrt{120^2+40^2}=126.49$, slant height of end.
$\sqrt{120^2+30^2}=123.69$, " " " side.
$80\times60\times120\div3=192000$; 192000 cu. ft. vol., *Ans.*

$\overline{60+60}\times 126.49\div 2=7589.4$, surface of ends.
$\overline{80+80}\times 123.69\div 2=9895.2$, " " sides.
$80\times 60=4800$. " " base.
$\overline{22284.6}$; 22284.6 sq. ft. surface *Ans.*

(**777,** page 439.)

2. $\overline{30+16}\times 7.5=345$; 345 sq. ft., *Ans.*

3. $(\overline{8\times 7}+\overline{4\times 7})\times 27.5\div 9=256\frac{2}{3}$; $256\frac{2}{3}$ sq. yd., *Ans.*

(**778,** page 440.)

2. $[(4^2\times .7854)+(3^2\times .7854)+\sqrt{(4^2\times .7854)\times(3^2\times .7854)}]\times 2=58.1196$; 58.1196 cu. ft., *Ans.*

3. $(\overline{1.25\times 1.25}+\overline{1\times 1}+\sqrt{1.25^2\times 1^2})\times 10=38.125$; 38.125 cu. ft., *Ans.*

4. 5 ft. $\div$ 3.1416 = 1.5917 ft., diameter of lower base.
3 ft. $\div$ 3.1416 = .95502 ft., " " upper base.
$1.5912\times 5\div 4=1.989625$, area of lower base in sq. ft.
$.9549\times 3\div 4=.716265$, " " upper " " "
$\sqrt{1.989625\times .716265}=1.1935$.
$(1.989625+.716265+1.1935)\times\overline{50\div 3}=64.9898$; 64.9898 cu. ft., *Ans.*

(**779,** page 440.)

2. $16\times 3.1416\times 16=804.25$; 804.25 sq. in., *Ans.*

3. 31.416 ft. $\div$ 3.1416 = 10 ft. = diameter.
$31.416\times 10=314.16$; 314.16 sq. ft., *Ans.*

4. 2 ft. $\times$ 3.1416 = 6.2832 ft. = circumference.
$6.2832\times 2=12.5664$; 12.5664 sq. ft., *Ans.*

(**780**, page 440.)

2. $30\times 30\times 3.1416\times \overline{30\div 6}=14137.2$; 14137.2 cu. in., *Ans.*

3. $10\times 10\times 3.1416\times 10\div 6=523.6$; 523.6 cu. yds., *Ans.*

4. 31.416 ft. $\div 3.1416=10$ ft., diameter.
$10\times 31.416\times 10\div 6=523.6$; 523.6 cu. ft., *Ans.*

(**781**, page 441.)

2. $\sqrt[3]{3000\div(2\times 3\times 4)}=5$; 2, 3, and 4 times 5 ft. or 10 ft., 15 ft., and 20 ft., *Ans.*

3. $\sqrt[3]{30720\div(3\times 4\times 5)}=8$; 3, 4, and 5 times 8 ft. or 24 ft., 32 ft., and 40 ft., *Ans.*

4. $\sqrt[3]{405\div(2\times 2\tfrac{1}{2}\times 3)}=3$; 6, $7\tfrac{1}{2}$, and 9, *Ans.*

(**783**, page 442.)

1. $\sqrt{1050\div 6}=13.2287+$, edge in ft.
$\overline{13.2287}^3=2315.03$, volume in cu. ft.

2. $\sqrt[3]{2150.42\times 1250}=139$; 139 in. $=11$ ft. 7 in., *Ans.*

3. $4^3 : 12^3 :: 1 : x$; $x=27$, *Ans.*

4. $(\overline{7^2\times .7854}+\overline{5^2\times .7854}+\sqrt{(7^2\times .7854)+(5^2\times .7854)})$
$\times\overline{7\div 3}=199.7534=$volume in cu. ft.
1728 cu. in. $\times 199.7584\div 231$ cu. in. $=1494.25$, No. of gal., *Ans.*

5. $(1.25^2+.5^2+\sqrt{1.25^2\times .5^2})\times 8=19.5$, No. cu. ft.
$\$.28\times 19.5=\$5.46$, *Ans.*

6. $1728 \div (\frac{1}{2} \times \frac{1}{2} \times 1) = 6912$, length in inches, $= 576$ ft., *Ans.*

7. $8.3^2 \times .7854 \times 7 \times 1728 \div 231 \div 31\frac{1}{2} = 89.9$, No. of bbl., *Ans.*

8. $(\sqrt{3^2 \div 2})^2 \times 18 = 81$, No. of cu. ft., *Ans.*

9. 7 sq. ft. 6 sq. in. $= 1014$ sq. in.; $\sqrt{1014 \div 6} = 13$, side of cube.
$13^3 = 2197$; 2197 cu. in. $= 1$ cu. ft. 469 cu. in., *Ans.*

10. 27 cu. ft. : 81 cu. ft. :: $10^3 : x^3$; $x = 14.42$, No. of inches, *Ans.*

11. $7912 \times 7912 \times 3.1416 \times 7912 \div 6 = 259333411782.8608$, volume in cu. mi., *Ans.*

12. There will be 12 times as many board ft. as cubic ft.
$((\frac{3}{4})^2 + (\frac{1}{3})^2 + \sqrt{(\frac{3}{4})^2 \times (\frac{1}{3})^2}) \times 11 \div 3 \times 12 = 40\frac{23}{36}$; 40 ft. $7\frac{2}{3}$ in., *Ans.*

13. $12^2 \times 6 = 864 =$ surface of cube $=$ surface of sphere.
$12^3 = 1728$ cu. in. $= 1$ cu. ft., volume of cube.
$\sqrt{864 \div 3.1416} = 16.58$, diameter of sphere.
$864 \times 16.58 \div 6 = 2387.52$ cu. in. $= 1$ cu. ft. 659.5 cu. in., volume of sphere, *Ans.*

14. $\sqrt[3]{4913} = 17$; $17^2 \times 6 = 1734$, surface in sq. ft., *Ans.*

15. $\sqrt[3]{2150.42 \times 450 \div 3} = 68.5$; 68.5 in. $\times 3 = 205.5$ in. $=$ 17 ft.
1.5 in., length; 68.5 in. $= 5$ ft. 8.5 in., width and depth, *Ans.*

16. $4.5^3 : 9^3$ :: 18 oz. : x; $x = 144$ oz., *Ans.*

17. $10 \times \overline{10 \times 3.1416} \times \overline{10 \div 6} \div 2 \times 1728 \div 231 \div 6 = 326.4$; 326.4 min. = 5 hr. 26 min. 24 sec., *Ans.*

18. $640 : 270 :: 8^3 : x^3$; $x = 6$, No. of feet, *Ans.*

19. $8^3 : 24^3 :: 8$ cwt. : x; $x = 216$ cwt., *Ans.*

20. 75 hhd. = 4725 gal. = 1091475 cu. in. = 631.64 cu. ft., contents of cistern.

$8^2 \times .7854 \times 1 = 50.2656$, No. of cu. ft. in cistern 1 ft. deep.

631.64 cu. ft. ÷ 50.2656 cu. ft. = 12.56+, No. of ft. in depth.

21. $3^2 : x^2 :: 2500 : 4960$; whence,

$$x^2 = \frac{4960 \times 9}{2500}, \text{and } x = \frac{3\sqrt{4960}}{50} = 4.225+, \text{ No. of in.}$$

22. $8^2 \times .7854 \times \overline{4 \div 3} \times 1728 \div 2150.42 = 53.855$, No. of bu., *Ans.*

(**786**, page 443.)

2. $21 + (\overline{30 - 21} \times \frac{2}{3}) = 27$; $27^2 \times 40 \times .0034 = 99.144$, No. gal., *Ans.*

3. $26 + (\overline{31 - 26} \times .6) = 29$; $29^2 \times 42 \times .0034 = 120.0948$, No. gal., *Ans.*

(**789**, page 445.)

1. \$42.75 × (189.5 rd. × 150) ÷ 160 = \$7594.80, *Ans.*

2. 70rd. × 70 = 4900 sq. rd. = 4000 sq. rd.; $\frac{4000}{4900} = \frac{40}{49}$ *Ans.*

3. 100 × (16 ch. × 15) ÷ 10 sq. ch. = \$2400, cost;
\$50 × (16 ch. × 15 × 16) ÷ (6 rd. × 5) = \$6400, sale;
\$6400 ÷ \$2400 = \$4000, gain, *Ans.*

4. $(\$2.75 \times \overline{160 + 40 \times 2}) - (\$2.75 \times 80 \times 4) = \$220$ less, *Ans.*

(**790**, page 447.)

1. 23040 A. ÷ 288 = 80; $\frac{80}{640}$ A. = $\frac{1}{8}$ Sec., *Ans.*

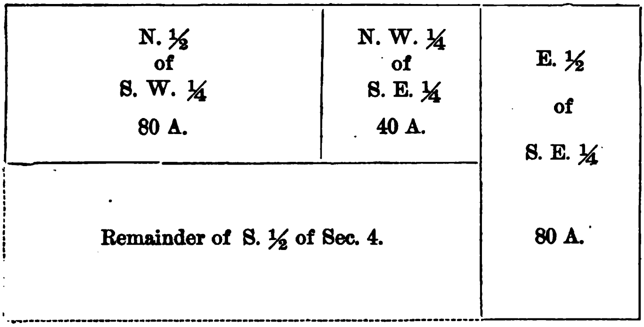
2. $\left(\overline{\tfrac{1}{2}\text{ mi.} \times 4 \times 320} \div 2\text{ rd.}\right) \times 3 \times 6 = 5760$ rails;
   $40 × 5.76 = $230.40, *Ans.*

3. $2.25 × 320 = $720; $4.375 × 160 = $700;
   $700 − ($720 ÷ 2) = $340, gain, *Ans.*

4. 160 A. + 80 A. = 240 A. $\frac{240}{640}$ A. = $\frac{3}{8}$ Sec., *Ans.*

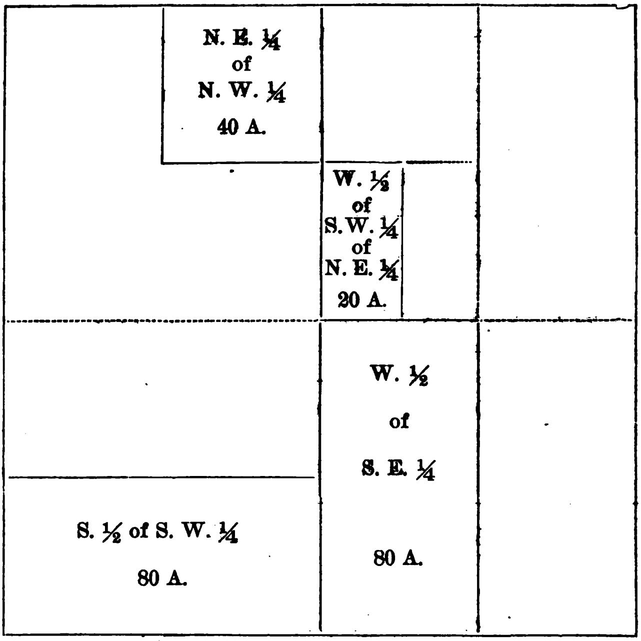
5. $2 × 320 = $640, purchase; $2.75 × 80 = $220;
   $3.50 × 40 = $140; $3.84 × 80 = $307.20;
   320 A. − (80 A. + 40 A. + 80 A.) = 120 A. left;
   $220 + $140 + $307.20 − $640 = $27.20, gain, *Ans.*

HALF-SECTION.



6. $1.25 × 640 = $800, purchase;
   $2.50 × 80 = $200; $1.75 × 40 = $70;
   $2 × 80 = $160; $3 × 20 = $60;
   640 A. − (80 A. + 40 A. + 80 A. + 20 A.) = 420 A. left;
   $2.25 × 420 = $945;
   $945 + $200 + $70 + $160 + $60 − $800 = $635, gain.

SECTION.



(**791**, page 448.)

2. 5 ft. 3 in. = 63 in.; (144 sq. in. × 7) ÷ 63 = 16 in., *Ans.*

3. (14 ft. × 3 × 4 × 8) ÷ 12 = 112 board ft.;
$9.50 × .112 = $1.064, *Ans.*

4. $(\overline{1728 \text{ cu. in.} \times 15} \div \overline{10 \times 16}) \div 12 = 13\frac{1}{2}$ ft., *Ans.*

5. $(36 \text{ ft.} \times 10 \times \overline{12 \text{ in.} + 9 \text{ in} \div 2}) \div 12 = 315$ board ft.;
315 board ft. ÷ 12 = $26\frac{1}{4}$ cu. ft., *Ans.*

6. $(\overline{16 \text{ ch.} + 8 \text{ ch.}} \times 4 \times 16\frac{1}{2} \times 2) \div 8 \text{ ft.} = 396$ posts;
$(\overline{16 \text{ ch.} + 8 \text{ ch.}} \times 4 \times 16\frac{1}{2} \times 2) \div 16 \text{ ft.} = 198$ panels;

16 ft. $\times (12+6+\overline{9+3}) \div 12 = 60$ sq. ft. in a panel;
60 sq. ft. $\times$ 198 = 11880 sq. ft., lumber;
($25 $\times$ 3.96) + ($14.80 $\times$ 11.88) = $274.824, cost, *Ans.*

(793, page 449.)

2. 8 in. + $(\overline{.25 \times 2} \div 2)$ = 8.25 in., length;
2 in. + $(\overline{.25 \times 2} \div 2)$ = 2.25 in., thickness;
8.25 in. $\times$ 2.25 = 18.5625 sq. in., area;
16.5 in. $\div$ 4 = 4.125 in., width;
18.5625 sq. in. $\times$ 4.125 = 76.5703125 cu. in. in a brick;
1728 cu. in. $\div$ 76.5703125 cu. in. = $22\frac{206}{363}$ br. in a ft.;
12 ft. $\times 24 \times 1\frac{3}{8} \times 22\frac{206}{363} = 31278\frac{6}{11}$ bricks, *Ans.*

3. (60 ft. $\times$ 16.5 $\times$ 1.5) $\div$ 24.75 cu. ft. = 60 Pch., *Ans.*

4. (120 ft. $\times$ 6.75 $\times$ 1.5) $\div$ 24.75 cu. ft. = $49\frac{1}{11}$ Pch., *Ans.*

5. $.56 $\times$ (240 ft. $\times$ 38 $\times$ 8.5) $\div$ 27 cu. ft. = $1607.82, *Ans.*

6. $(\overline{41\frac{1}{4} \times 2} + \overline{33 \times 2}) \times 8 \times 1\frac{1}{2} = 1782$ cu. ft.;
1782 $\div$ 22 = 81 perches;
(41.25 $\times$ 33 $\times$ 8) $\div$ 27 = 403 loads; $.50 $\times$ 403 = $$201\frac{1}{2}$;
$\overline{\$3.75 \times 81} + \$201\frac{1}{2} = \$505.42$, *Ans.*

7. 8.25 + $(\overline{.25 \times 2} \div 2)$ = 8.5 in., length;
2.375 + $(\overline{.25 \times 2} \div 2)$ = 2.625 in., thickness;
8.5 in. $\times$ 2.625 = 22.3125 sq. in., area;
17 in. $\div$ 4 = 4.25 in., width;
22.3125 sq. in. $\times$ 4.25 = 94.828125 cu. in. in a brick;
1728 cu. in. $\div$ 94.828125 cu. in. = 18.222 br. in a ft.;
60 ft. $\times 21\frac{7}{8} \times 1\frac{5}{12} = 1859.375$ cu. ft., in wall;
1859.375 cu. ft. $\times$ 18.222 = 33881.53125 bricks;
$12.50 $\times$ 33.88153125 = $423.52, *Ans.*

8. 37.5 ft. × 9 × 2 × 2 = 1350 cu. ft., sides;
(26 ft. — 2 ft.) × 9 × 2 × 2 = 864 cu. ft., ends;
1350 cu. ft. + 864 cu. ft. = 2214 cu. ft., masonry;
$3.85 × 2214 cu. ft. ÷ 24.75 cu. ft. = $344.40, cost, *Ans.*

(**795,** page 451.)

1. (8 ft. × $6\frac{1}{2}$ × $3\frac{1}{3}$ × 1728) ÷ 2150.42 = 139.279 bu., *Ans*

3. (324 bu. + 81 bu.) ÷ (6 × 4.5) = 15 ft., *Ans.*

4. (12 ft. × 3 × 2.5) — $\frac{1}{5}$ = 72 bu., barley, *Ans.*
72 bu. — $\frac{1}{5}$ = $57\frac{3}{5}$ bu., apples, *Ans.*

5. $2 × $\left(\overline{20\text{ ft.} \times 12 \times 5} - \frac{1}{5}\right)$ = $1920, *Ans.*

6. $1.375 × (7 ft. × 6 × 5 — $\frac{1}{5}$) × $\frac{3}{4}$ = $173.25, *Ans.*

7. $\left(\overline{15\text{ ft.} \times 7\frac{1}{3} \times 8} - \frac{1}{5}\right) - \frac{1}{5} = 563\frac{1}{5}$ bu. of ears;
$.92 × $563\frac{1}{5}$ ÷ 2 = $259.072, *Ans.*

8. (10 ft. × 5 × 4) — $\frac{1}{5}$ = 160 bu.;
48 lb. × 160 ÷ 196 lb. = $39\frac{9}{49}$ bbl., *Ans.*

9. $1.50 × 12400 = $18600, cost;
(12400 bu. ÷ 8 bu.) × 6 = 9300s., freight;
(12400 bu. × 60 ÷ 100) × 12 = 89280s.;
$\left(\overline{89280\text{s.} - 9300\text{s.}} \div 20\text{s.}\right) \times 4.8665 =$ $19461.1335;
$19461.1335 — $18600 = $861.13 gain, *Ans.*

(**796,** page 452.)

2. (48 hhd. × 63 × 231) ÷ 1728 cu. in. = $404\frac{1}{4}$ cu. ft., *Ans.*

3. $\left(\overline{11\text{ ft.} \times 6 \times 7 \times 1728} \div 231\text{ cu. in.}\right) \div 63\text{ gal.} = 54\frac{6}{7}$ hhd., *Ans.*

4. (22.5 ft. × 3.25 × 6.4 × 1728) ÷ 231 cu. in. = $3500\frac{68}{77}$ gal., *Ans.*

5. (32 hhd. × 63 × 231) ÷ (6 ft. × 8 × 144) = 5 ft. $7\frac{3}{8}$ in.

6. (6.5 ft. × 4 × 3.5 × 1728) ÷ 231 cu. in. = $680\frac{8}{11}$ gal.;
$8\frac{1}{3}$ lb. × $680\frac{8}{11}$ = $5672\frac{8}{11}$ pounds, *Ans.*

7. (67.2 cu. in. × 64) — (57.75 cu. in. × 64) = 604.8 cu. in.

8. 10 bu. × 2150.42 = 21504.2 cu. in.;
($.25 × 21504.2 cu. in. ÷ 57.75 cu. in.) — ($5 × 10) = $43.09, *Ans.*

9. (5 ft. × 4 × 3 × 1728) ÷ 231 cu. in. = $448\frac{64}{77}$ gal.;
1 hr. 30 min. = 90 min.; $448\frac{64}{77}$ ÷ 90 = $4\frac{76}{77}$ gal., *Ans.*

10. (5000 gal. × 4 × $57\frac{3}{4}$) ÷ ($67\frac{1}{5}$ cu. in. × 8 × 4) = $537\frac{7}{64}$ bu., *Ans.*

11. (40 ft. × 20 × 8 × 1728 ÷ 2) ÷ 231 cu. in. = 23937.66 gal.; $.06 × (23937.66 gal. ÷ 63 gal.) = $22.797, *Ans.*

12. $24\frac{2}{3}$ ft. × $12\frac{3}{4}$ = $314\frac{1}{2}$ cu. ft.;
314.5 cu. ft. × 1728 ÷ 231 cu. in. = $2352\frac{48}{77}$ gal., *Ans.*

NOTE.—Such changes have been made in this Key as will make it harmonize with the editions of the Higher Arithmetic printed since 1875.

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